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THE AMERICAN REVIEW OF TUBERCULOSIS

JOURNAL OF

THE NATIONAL TUBERCULOSIS ASSOCIATION

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CONTENTS

CHARLES L. MINOR: The Psychological Handling of the Tuberculous Patient 459

TOHRU ISHIGAMI: The Influence of Psychic Acts on the Progress of Pulmonary Tuberculosis .. 470

EVERETT MORRIS: Induced Pneumothorax. Its Use in the Treatment of Pulmonary Tuberculosis. With a Report of 202 Cases 485

S. A. SLATER: Artificial Pneumothorax and Pregnancy 497

H. F. GAMMONS: Artificial Pneumothorax in Tuberculous Pneumonia 501

Medical Notes, Abstracts and Reviews 503

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THE PSYCHOLOGICAL HANDLING OF THE TUBERCULOUS PATIENT

CHARLES L. MINOR

Asheville, North Carolina

In no disease is the relation between mind and body, between the psychical and the physical, so close and so important as in pulmonary tuberculosis and the physician who would successfully treat this trouble must be prepared to pay almost as much attention to his patient's psychic side, to his mental attitude, and to his reaction to his sickness, as does the neurologist.

Indeed, in the formation of a prognosis in pulmonary tuberculosis, the patient's mental state is fully as important as is the physical condition of his lungs, and the physician who neglects the former, who for example fails to find out the hidden business worry, the unhappy love affair, or some other thing that is preying on his patient's mind, and depriving him of mental poise and rest, is sure to slip up both in his prognosis and in his treatment.

We all feel a delicacy in forcing ourselves into the privacy of our patient's hidden griefs or troubles, feelings or prejudices; and hence, very naturally, we are apt to neglect this all-important side of the healing art and to occupy ourselves too exclusively with the treatment of the physical ailment and thus often fail in our efforts, whereas, had we but got a comprehension of his mental state, we might have succeeded.

When the patient comes to see the physician, it is his physical complaints of which he is thinking and of which he talks, and he either does not recognize the relation to them of his psychic life or, if he does so, is usually anxious to conceal this from the physician.

Right in the beginning of treatment, therefore, the physician handling a case of tuberculosis, more than in most diseases, is forced to realize that his history must be far more searching in its inquiry into the psychic life of his patient than is usually the case, that tactful questioning can yield invaluable information on this score, and that a history so taken will give that fuller knowledge of the personality of the case which is so necessary if we are to guide it aright.

If, as I believe, our treatment must be as much that of the mind as of the body, I do not hesitate to state that such a properly taken history is just as necessary as a careful physical examination. Indeed, while the history brings out many physical facts, the psychic side of it is so important that we might well call this part the "Psychical Examination" in contradiction to that examination which we call the "Physical Examination." If we are tactful such a history need have about it no element of vulgar prying into the private affairs of our patient who will be made to realize that we are only seeking for such knowledge in order to enable us to master his case. Of course, much of the needed information of this sort cannot be got at the time of the history taking, but comes to us by degrees as we more fully win the patient's confidence and come to know him better, but the beginning must be made at that time.

But before I spoke of the history, I should have referred to the all-important first interview between the doctor and his patient. Whatever the disease, but more especially in tuberculosis, mutual confidence is all-important, and this first interview should give the keynote to the future relations between the physician and the patient; and hence we should give it all the time and care necessary to lay the foundations of that trust in the physician, that feeling of his sincerity and of his interest in the case on which future success so greatly depends. The patient must be made to comprehend the necessity of complete coöperation between himself and his physician, must learn that the doctor is not just a writer of prescriptions, but a teacher, a senior partner, and a friend, to guide him back to health. It must be made very clear to him that, if success is to be had, absolute obedience and discipline are necessary, and that without them we cannot wisely undertake the case. A patient should be afraid to disobey, but a discipline that rests only on fear is not reliable, and a satisfactory discipline must arise from a patient's desire to do what the doctor wants and this, in the final analysis, depends on his trust and his affection. The masterfulness sometimes necessary in the handling of a patient's case may be at first unwelcome, but that coöperation which must develop between the physician and patient cannot be built on a weak foundation; and people are more willing to yield obedience if they see that the doctor means what he says, that he is in dead earnest, and that his yea is yea and his nay, nay. From such a foundation will spring not merely obedience but that trustful affection which alone can make obedience a pleasure.

After the half-hour or more of such a first interview the physician should be so established in his patient's confidence that he can get from him that complete coöperation from which alone spring good results.

If the patient is to be treated in his own home, it is important that the physician familiarize himself with the psychic environment of that home. The temperaments and the idiosyncracies of the members of the family can have a happy, but too often also, an unhappy effect on the treatment. All physicians know how often a mother is a handicap to the treatment of her child, usually because she loves not wisely but too well. Where the heart comes in the head is apt to go out and usually the patient does much better if the mother is away. Sisters are usually helpful unless, as sometimes happens in families, there is too radical an incompatibility of temperament; while aunts, who usually have an abundance of affection but not too much, are a great help. The trouble of the cure in the home is that it is very lonely, and the patient sadly lacks the example and assistance of fellow patients, while outsiders make more interesting companions than his own family because they offer him more variety. In these days of phthisiophobia much harm is done the patient by the way relatives who feel, and too often cruelly show, an unreasoning dread of infection, treat the invalid. The added sorrow which is thus often brought to him is a very harmful psychic influence from which the physician will have difficulty in freeing him. Hence he must familiarize himself by question, by observation, and if necessary, by outside inquiry, with the home conditions, and by plain but tactful talks remedy these when possible. If the patient is treated in a sanatorium, which is not possible in many cases, phthisiophobia will not trouble us; but we may have trouble from homesickness, though much more rarely than the public supposes, for if the atmosphere of the house is what it should be, the preliminary homesickness, soon dies out in all but a very few. A greater trouble is the wear on unusually nervous people of the constant company of others and the absence of privacy, while some find it very difficult to adapt themselves to the crowd. The chiefest difficulty, however, is the tendency of most patients to talk of their symptoms to others, and to hand on their troubles. As long as men are selfish and think too much of their own troubles and take too little interest in other people this will bother us, but if the patient when he goes to the sanatorium, is given a strong talk on the necessity of "burying his sorrows," of putting aside

his own troubles, and exerting himself to find the interest and the good points in his fellow-patients, and in trying to keep the atmosphere of the family cheerful, as it should be, only a few of the most sensitive will before long fail to adapt themselves happily to the household life; and it is remarkable to see how under this atmosphere of cheerful mutual help and good will, the morose or solitary will come out of their shells and discover the great truth that happiness is never found in ourselves, but only in going out into the lives of others. If the right atmosphere is to be kept in such houses, it is most desirable, if it be at all possible, that they be small, that the patients be largely of one stage, and, as far as may be, of one social condition. This tends to homogenize the crowd and enables it to become a jolly, happy family. As to its size, if there be too many people, it is impossible to prevent cliques with all their bad effects, or to keep up a kindly good feeling, and hence, where possible, there should not be more than thirty or at most forty people, or better yet, twenty-five. As to the medical condition of the patients, advanced cases quickly discourage incipient ones. Their cough is most distressing to those who know what it means; the deaths that must from time to time occur among them have a disastrous effect on the household spirit, while on the other hand the ability of lighter cases to do things which are impossible for these sicker ones is most discouraging to the latter. For this reason, there should be a strict division according to the stage of the sickness.

While social selection of patients is most difficult and can only be carried out to a limited degree, it is very important. Mrs. Social Leader will not mix with Mrs. Ordinaire easily or naturally, though men are better about this, and where mutual scorn or resentment exists the creation of a proper atmosphere is impossible. It is essential that the patients mix easily and happily and the more kindly the interest —short of sentiment, which must be taboo—which they can take in each other, the less they think of themselves and their troubles, the better the whole household will do. For this reason the occupants of a cottage sanatorium should not be of either extreme of the social scale, and people of moderate means whose breeding enables them to rise superior to the more artificial of our social distinctions, and who are not too strictly bound by the narrower views of high society, make the best inhabitants of such a cottage. Professional and business classes, teachers, etc., who, while believing in social distinctions, have not elevated them into an indispensable fetish, nor have lost the blessed

ability of finding interest in other people, even though they be of a somewhat different social status from their own, are those who get and give the most good during the cure. A house full of such people, wisely trained by the doctor to consider each other and to conceal their own troubles, save from the physician or the nurse, can become one of the jolliest, most kindly and enjoyable aggregations of humanity to be found anywhere, so that the end of the cure which sends them home, is by no means an unalloyed pleasure inasmuch as they must leave so congenial a circle. The good effects of such an atmosphere on our patients can easily be realized. Cheerfulness, that keystone in the cure of tuberculosis, is present and blessedly effectual; esprit de corps is strong, helping the unruly to obey and is wonderfully helpful in bracing weak wills to take the cure strictly and honestly; and time, which can hang so heavily on an invalid's hands, passes quickly and pleasantly. Such a plan demands not one big sanatorium, but several smaller cottage sanatoria, and it depends on the ingenuity and knowledge of human nature of the physician at his first interview, to decide wisely on the location of a new patient he has never seen before so as to keep each household happy and contented, for an unwise location will not only hinder the patient's cure, but, if he be of an unfortunate temperament, will upset the whole household.

Most people if they are shown the need, for their own benefit, of cheerfulness and thoughtfulness for others, will with occasional bracing up and some tactful handling, learn to consider others and to wear a cheerful countenance until, to their surprise, the outward smile brings an inward cheer, for none of us can interest ourselves in the other fellow's point of view without sooner or later losing a good part of our "grouch" and certainly there is no room in a sanatorium for dismal or "grouchy" people.

All these psychic advantages of taking the cure with others are missed by the very rich to whom their luxuries have become their necessities and whom no sanatorium can satisfy, and whose riches have made them unadaptable and unwilling to obey. The rich man in his fine house finds it much harder to get those favorable conditions for the cure which are easily had by the lawyer, the professor, or the business man of infinitely smaller means. As I have already said, the patient taking the cure alone, finds time hanging very heavily on his hands. He has nothing to do but to think of himself, a very bad thing for any of us, and misses, though he may not know it, the example, the jolly

talk and the encouragement of fellow patients, and can rarely, however hard he may try, be as readily trained in self-denial, wise living, normal thinking and how to face his sickness as can his less wealthy and more fortunate brother.

Once located, it is important that the patient be seen often enough for the physician to keep in close touch with his life, to insure his training, to keep up his courage and to show him how to meet his problems. It is necessary, of course, to train him how to conduct the physical part of his cure, but it is usually just as essential to give him a new and more optimistic view of life, for there are few patients who, when their whole life has been disorganized by the explosion in its midst of that terrible bomb, the knowledge that they have tuberculosis, do not need all the psychic help that the doctor can give in order to readjust themselves, to take new bearings, and to learn what tuberculosis is and how morally to face it. At first the patient should be seen twice a week, but when we know him, once a week is sufficient. If we see him less often than that, we will lose touch with his life and this is better not tried save in very well trained people.

As soon as their condition will permit of it, and this is best judged by the fever and the pulse, it is best for them to come to the doctor's office. Here we are not disturbed by the family or the nurse, and from the vantage ground of our office chair in our consultation room, where we are most at ease and most able to impress ourselves, we can best understand him; and here we are best able to show him our meaning and hammer home our teaching. No physician can have a more delightful, even if exhausting task, than the office interviews with such patients. To see fear die out of their eyes as comprehension of their problem comes, to bring hope where there was hopelessness, to show them the path that will lead them to the light when they have seen only gloom and despair and darkness before, to correct their always distorted ideas of what tuberculosis is, and to show them that it is by no means always the horrible curse they think, is one of the most beautiful tasks of a beautiful profession. To awaken will power and to evoke strength of character are worth any man's time, and one of the rewards which comes to the faithful patient is that character building which is his who day after day has the courage to deny himself pleasure for profit, to expel gloom with cheerfulness, and to turn his will power to self-mastery as the tuberculous must. Again, to teach so many who have never learned it, how to get into contact with their fellow-men, to show those

who have become entrapped in the narrow prison of their own selfish interests how to get out and take an interest in other lives, should teach optimism and faith in mankind to the most pessimistic doctor that ever was born. Thus, by degrees, as we cure the patient's body we are curing his mind, teaching him cheerfulness, optimism and hope, and preparing him to return to his home not merely restored physically, but recreated mentally, and able to face his life more bravely and better than he ever did before.

The general practitioner may think that such a system of controlling the mental side of his tuberculous patients would be too time-consuming to be practicable for him, but it need not be so by any means, and I feel sure that he could get very satisfactory results with many of his tuberculous patients if he would try it. Any doctor can give fifteen minutes twice a week to a talk with his patient, and an hour once a month to a thorough and well recorded physical examination. The great thing is that those fifteen minutes be used not merely in inquiring into the patient's physical welfare and symptoms, but in studying the mental side of his case, and if the physician does so, he will find the study of his patient's personality so fascinating, will find that it makes the case so much more interesting, and that it will make his work a pleasure and not a task, A few patients, it is true, are refractory to such treatment, and ensconce themselves behind a wall of impassivity with a notice outside of "no admission," but with the large majority it is perfectly feasible and will fully repay our efforts.

Turning to a consideration of the psyche of the tuberculous, such patients are by no means always or even often abnormal as has been implied by some writers, though we see a good deal of neurasthenia and hysteria among them and they are apt to have a rather labile temperament. The temper in early cases is quicker, the imagination more lively (accounting perhaps for the many literary lights among their number), the will tends to be somewhat less strong, the emotional life a a little less under control; but the majority are practically normal psychic beings. The will, where it is weak, and even more so if it is only weakened, is infinitely capable of training and development, the strong imagination enables us to appeal to them to make a good fight, and while the neurasthenia often gives us much trouble, it too can yield slowly as the patient returns to more normal health. As Osler has shown, in the ranks of the tuberculous have been a large number of the world's literary and artistic leaders and men and women of genius.

and when the doctor meets such they reward him with the charm of such an association as Trudeau found with Robert Louis Stevenson. There is of course difficulty in disciplining and training such children of nature; and a real genius is always a hopeless patient, incapable of teaching, and resentful of all control when the spirit is on him. But we will usually find our imaginative patients far more amenable to treatment than are the dull, unimaginative fellows who are too matter of fact to get interested or enthused over anything.

The psychical state of the tuberculous has been much discussed, and one hears *ad nauseam* of the "Spes Phthisicorum," which however is only seen in late cases, and is a blessing sent by nature for euthanasia at the end of a long and losing fight, and is not the mental habit of the average patient. Cornet, quoting Heinzelmann, has described the tuberculous as mostly abnormal, but, after twenty-two years of experience with tuberculous people of the upper and middle classes, I do not find that we meet with marked psychical abnormalities in these cases, save those I have referred to, in any greater number than would be the case with other chronically sick people. This view has been well stated by Sokolowski who says:

> There is no doubt, that so wary and severe a disease as tuberculosis, a disease which not only drags down the patient physically, but him and his dear ones materially and morally, and which destroys the most brilliant prospects, and the greatest talents in the period of bloom, must influence the psychic condition of the invalid. Therefore, it is no wonder that one notes in most patients, especially in those of the most intelligent class, in the course of consumption, numerous neurasthenic symptoms.

This agrees entirely with my experience, and he who has himself had to face that first terrifying fact that he has tuberculosis, before he has learned what the disease really is, and when it connotes to him only every imaginable suffering and terror, will not greatly wonder that it causes a fearful upset of the patient's mental poise and can easily produce in any but the most phlegmatic or in the most self-controlled, a temporary neurasthenia. I have seen the dread of it drive some to suicide; but what calamity but has had such a result in a few people always? I have seen men's temperaments ruined and soured by the discovery; but who has not seen the same results from financial reverses or family sorrows? I have seen people's weakest and worst side brought to the front by this as by other reverses, but I could write a whole book

on the magnificent way in which I have seen stricken men and women rise to the battle, and defy fate, and keep their heads high in the face of the overwhelming disaster which tuberculosis is to so many. I have seen this courage bring its reward in recovery and health, but I have seen it equally in hopeless cases where the only reward has been the consciousness of fate bravely met, of a losing fight fought pluckily to the end. I have seen many learn to think of others rather than of themselves and, while they buried deep within their hearts the sorrow that sickness had brought to them and the troubles that it multiplied, I have seen them bringing sunshine and happiness to those around them, and inculcating optimism and cheerfulness in their companions until its reflex came back to them and helped to lighten their own grief.

Let me say right here that there is no such school of character as tuberculosis bravely met and rightly faced. I have seen weak characters grow slowly strong through the self-denial which their sickness necessitated. I have seen selfish people grow unselfish through the opportunity for daily consideration of others. I have seen a dark and inevitable end courageously faced through the strength brought by daily self-denial. For one coward who whined as he went downward to the grave, I have seen ten brave men and women whose courage was an inspiration to all who saw it.

Again, let me quote Sokolowski who, speaking of these patients, says,

> They are characterized by an even temper, bearing with wonderful patience the whole course of the sickness in its various phases. Many show a wonderful energy and strength of will with which they try to fight the sickness, unmoved and undeceived by the difficulties and material losses which postponed the longed for resumption of work and social position. I have seen many such patients and their constant calmness of mind during their severe sickness, their remarkable determination and effort at recovery, awakened in me always the greatest wonder at their strength of character. They gave me the impression of great warriors, who, in order to win the longed for victory, had laid aside all obstructions in the way by the strength of their own wills.

No doctor could want a more splendid work than to have a part in teaching these patients so to master the bitter sorrow of sickness as to draw from it the sweet reward of regained health and of strength of character, of a broad, charitable, sympathetic view of their fellowmen and of life; and the healing art reaches no higher plane than when it is able to minister thus, not merely to the bodies, but to the minds and souls of sufferers.

But, if we are to treat tuberculosis successfully, if we are to help the mind as well as the body, we must be optimists. We must be hopeful if we are to inculcate hope. We must believe in our ability to help tuberculosis even when it cannot be cured, and in its curability in many cases. Without such a hope, we may scientifically study their disease but we can never stimulate our patients to the fight, and our visits will leave them as hopeless and as sad as when we came. We must be a source of electric current to recharge the exhausted storage batteries of their minds and give them new strength.

Cheerfulness and optimism are to my thinking the keynote to the treatment of this disease and no man can successfully imitate a cheerfulness that does not exist in himself, nor hide from the patient a skepticism as to results which he feels. The patient must believe in your ability to treat him, must believe in your interest in his case; he must absorb from you optimism and fighting power, for without hope he may indeed be taught to face the inevitable bravely, but he cannot possibly win his fight. But some may ask, how can we be hopeful in such a disease? After years spent in treating it, after a personal familiarity with it, after a wide reading of the literature on the subject, I am yearly more and not less hopeful as to its outcome. Not because I get any better results than anyone else, not because I do not see many whom I cannot save, but because I see so many who can be restored to working efficiency for long periods or for good; because even in the long drawn-out, chronic case, life can be made useful and filled with interests and happiness, if the patients are but taught to face it aright.

I have no patience with the pessimist in this disease. He only does his patient harm. I believe such pessimism comes from a too material view of the matter and that more attention to the psychic side will change our conception of what tuberculosis is and what we can accomplish for it.

I know very well how many tragedies it brings about. I have seen too many of them myself, but I have seen such tragedies turned to triumphs by that conquest of his own mind which the patient has achieved.

A foolish optimism which refuses to see the truth, and makes impossibly bright prognoses from a cowardly inability to face the sad facts which science has taught us, is a miserable thing that only doubles the sorrow of the patient, when, after enjoying for a while a fool's paradise, he comes to a realization of the sad facts which a mistaken kindness

or an unpardonable ignorance or weakness have concealed from him. But a wise optimism which acknowledges the seriousness of the task before him yet can teach the patient how to hope, how to rally his will from the hard encounter, how to face the facts, told not brutally but honestly and tactfully, can give a power to fight whose value cannot be over-estimated in its effects on the success of our physical efforts.

Finally, let us never forget that our efforts are not to be directed merely to curing our curable patients, but to enabling even the apparently hopeless ones to fight to the end, to keep them heartened up, so that even in dying they may win that last triumph over the universal victor, by facing him dauntlessly as they cross the bar.

THE INFLUENCE OF PSYCHIC ACTS ON THE PROGRESS OF PULMONARY TUBERCULOSIS[1]

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Recently a relation between physiological activities and psychical changes has been established by actual experimentation in several instances. Pawlow (1902) and his pupils noted such a relationship in the study of gastric secretion. Cannon (1910–1911) and his pupils have recorded an increase in the adrenal secretion and an increase in the blood sugar associated with psychical excitation. It has long been recognized that the mental state of a patient has a great deal to do with his reaction to disease. I have noted this relationship in the treatment of tuberculosis. It thus became of interest to study the relation between various mental states and the opsonin production in tuberculous patients. Attracted by the observations of Cannon, I have attempted to ascertain whether the change in sugar metabolism and secretion of adrenalin have any association with the change in the opsonic index. To determine this both animal and test tube experiments have been performed.

CLINICAL OBSERVATIONS

Since 1906, I have conducted a series of opsonin examinations in a large number of tuberculous patients. In general it has been found that the opsonic index of patients with advanced tuberculosis is lower than in the less advanced cases, and that the proper treatment with the injection of antigen and immune serum gradually raises the index until an index of 1 or 2.5 is reached. Patients gain in weight simultaneously. In untreated cases, the index is generally higher in those with a more favorable prognosis. When the index fluctuates constantly, with occasional high index but usually low, prognosis is invariably unfavorable. These observations have been reported previously.

[1] Translated by Goichi Asami, Washington University School of Medicine, Saint Louis, Missouri.

Sudden lowering of the opsonic index is frequently the result either of improper administration of tuberculin and other injected materials or to excessive exertion on the part of the patients (auto-inoculation). A high febrile condition invariably sets in, and subsides to normal in the course of a few days. In cases where neither one of the above factors can be traced as causing the lowering of the opsonic index, high fever usually does not occur, and the opsonic index returns to normal in two or three days.

The conditions leading to this latter phenomenon have been found to be associated with mental excitation. The cause of this mental change may have been a letter from home or a conversation with visitors which caused the patient to worry and lie awake the night before examination. The depressed opsonic index lasts only a few days as usual, but, if circumstances causing such mental states are prolonged, the return to the normal index is correspondingly delayed, giving rise to what Wright terms the "cumulative negative phase." The course of the disease is made gradually worse, with loss of appetite, insomnia, and high fever. Local symptoms increase, and the opsonic index is kept low. The personal history usually reveals failure in business, lack of harmony in the family, or jealousy of some sort. Nervous individuals are especially prone to attacks of this type, and the prognosis is generally bad.

On the other hand, patients with extensive local manifestations and with sputum rich in microörganisms may have a comparatively high opsonic index and the disease follow a favorable course. These patients are found to be optimistic and not easily worried.

Again, in chronic cases, patients may go on apparently well without any subjective knowledge of symptoms, with a relatively high opsonic index until some misfortune happens. This immediately alters the course of the disease. Patients beyond the secondary stage may appear well while nursing their consumptive mother, wife, child, or some such close relatives. However, should their dear ones happen to die, with the subsequent despair comes a sudden appearance of severe symptoms with a lowered opsonic index. These cases may die.

The above are only a few instances of my clinical observations extending over a period of ten years. Since any number of clinicians will substantiate these statements, I shall avoid the cumbersome task of citing further cases.

The significant point in my observations lies in the determinations of the relationship existing between clinical symptoms and opsonic indices which are influenced by psychic states.

To determine whether or not an actual increase of the sugar in the blood is produced by psychic excitations, a urine analysis was made weekly or, in cases deemed necessary, daily in 140 cases. Of these, 30 per cent or 42 patients showed glycosuria, as follows:

Number of patients examined for glycosuria	140
Number of patients showing glycosuria	42 or 30 per cent
Number of patients who had glycosuria previous to admission to the Institute	2
Number of patients showing transient glycosuria	40

Of these cases, 26, or 65 per cent, had advanced tuberculosis, and 14, or 35 per cent, were less advanced cases. They were all nervous individuals, being easily excited by trivial things. The opsonic index was low in each case. Urine analysis was made by combined Trommer and Nielander methods in the uncertain cases. The phenyl-hydrazine method, the polariscope, and fermentation methods were also used.

It is interesting to note that out of 140 cases, 7 were fatal during the last four months and all of these had a glycosuria. It is true that all consumptive patients may excrete sugar either transiently or continuously prior to death.

ANIMAL EXPERIMENTATION

The influence of adrenalin and glucose upon the opsonin reaction was determined by examination of phagocytosis after intraperitoneal injection of a mixture of these substances and emulsions of tubercle bacilli in one series, and by intraperitoneal injections of bacillary emulsion into animals which were previously inoculated subcutaneously with adrenalin and glucose.

Several loop-fulls of young cultures of tubercle bacilli of known virulence were freed from moisture with filter paper, ground in a mortar, and suspended in a definite quantity of isotonic sodium chloride solution. The emulsion was filtered through paper and the filtrate was centrifugalized. A supernatant fluid portion was used, which upon examination presented from 10 to 15 organisms per optical field.

An alcohol and ether mixture was used in fixing the specimens. Ziehl-Gabett solution was used for staining. Dilute methyl orange was used as counter-stain. One hundred phagocytes, chiefly polymorphonuclears, were examined for the number of organisms engulfed in each.

Organisms engulfed in a lump were counted as one, and a cell containing over six organisms was considered as containing five organisms.

Series 1. In this series mixtures of a suspension of tubercle bacilli with adrenalin and glucose were injected intraperitoneally into healthy guinea pigs. After a given period of time the peritoneal fluid was drawn out and examined. Rabbits, white rats, and guinea pigs were used as control animals. Data obtained for guinea pigs alone are recorded as controls because of the cumbersomeness of tabulation.

The percentage of phagocytosis was determined by averaging ten counts. The weight of the guinea pigs was from 300 to 500 grams. The results of this series may be tabulated as follows:

TIME	CONTROL 5 CMM. TUBERCLE BACILLI SUSPENSION	GLUCOSE (2 PER CENT OF SUSPENSION) + 5 CMM. TUBERCLE BACILLI SUSPENSION	ADRENALIN (1 TO 1000) (0.5 CMM.) + 5 CMM. TUBERCLE BACILLI SUSPENSION
minutes			
15	Leucocytes scanty; phagocytosis not found; opsonic index 2.10	Same as control	Same as control
30	Phagocytes increased; phagocytosis active; index 2.10	Same as 15 minutes	Phagocytosis has occurred 0.41
40	2.15	0.40	0.55
60	2.50	0.42	0.89
90	2.50		
120	1.62	0.98	1.11
180	1.32	0.60	0.75

From the above data it is seen that both glucose and adrenalin have strong inhibitory action upon phagocytosis. The action of adrenalin is not, however, as pronounced as that of glucose.

Series 2. In this series the natural process was simulated as closely as possible by injecting glucose and adrenalin subcutaneously two or three hours previous to intraperitoneal injection of bacilli. At different intervals after the injection of bacilli, a sample of peritoneal fluid was taken out and examined for phagocytosis as in series 1. Subcutaneous injection of sugar and adrenalin was followed in two or three hours by an elimination of sugar in the urine of the animal.

1. The quantities injected were 0.1 gram (glucose) and 0.1 cmm. (adrenalin 1:1000) per 100 gram weight of the animal.

2. Tubercle bacilli emulsions were injected in quantities varying from 3 to 5 cmm. according to the size of the animal (for guinea pig and rabbit) and 2 to 3 cmm. for various sizes of white rats.

3. Phagocytotic indices were determined thirty minutes and two hours after the intraperitoneal injection of bacilli. Figures were taken from the average of six readings for guinea pigs and rabbits, and two readings for white rats, with the following results:

	GUINEA PIG	RABBIT	WHITE RAT
Control	2.17	1.51	2.35
Glucose	0.60	0.49	0.63
Adrenalin	1.74	0.87	1.56

In this experiment the inhibition of phagocytosis by glucose injection is considerable; and a similar but weaker inhibition is exerted by adrenalin injection. In the case of adrenalin, the inhibition may be considered due to the sugar increase in the blood caused by the adrenalin injection.

Series 3. Relation of the quantities of adrenalin and glucose injected and the extent of phagocytosis.

In the animal body the extent of phagocytosis varies with species, individuals, age, differences in the rapidity of leucocytosis, and in the strength of the opsonin reaction due to emotional states. For this reason, an accurate quantitative determination of the inhibitory actions exerted by glucose and adrenalin cannot be made by animal experimentation. In this series, therefore, only a rough estimate of the general quantitative relationship is to be expected.

It was found that glucose, mixed with tubercle bacilli emulsion to a 3 per cent concentration or over, inhibits phagocytosis when injected intraperitoneally, for several hours. As the concentration of sugar is decreased, this inhibitory action gradually decreases until with 0.1 per cent or lower this effect becomes almost negligible. The same relationship holds in the case of adrenalin; with 0.005 per cent phagocytosis is prevented entirely, and with 0.001 per cent the inhibition is greatly enfeebled.

TEST TUBE EXPERIMENTS

A. By the experiments described above, the presence of the inhibitory action of glucose and adrenalin upon phagocytosis in the peritoneal cavity was proved. In this present experiment, Wright's method was employed for the quantitative determination of the opsonic index, using dead bacilli as indicators.

As a control, normal human serum was used. It was taken from a person having a negative von Pirquet reaction and no physical signs of disease. It is customary to employ normal human leucocytes, but for convenience, white cells of guinea pigs were used as phagocytes.

Indices were computed from the averages of eight counts, discarding two doubtful results from the total ten counts.

Control: A mixture of equal volumes of normal human serum, emulsion of guinea pig leucocytes, and tubercle bacilli emulsion was examined for phagocytosis and the amount of phagocytosis determined was taken as the standard in computing the opsonic index for each of the following tests.

Test 1. For the first test mixtures containing equal volumes of normal human serum, guinea pig leucocytes, tubercle bacilli emulsion and solutions of glucose (8 per cent, 4 per cent, 2 per cent, 1 per cent, and 0.4 per cent) were prepared. The percentage of glucose in these solutions was reduced by the mixing to 2 per cent, 1 per cent, 0.5 per cent, and 0.25 per cent and 0.1 per cent respectively.

Test 2. For the second test normal human serum, guinea pig leucocytes, tubercle bacilli emulsion, and adrenalin solution were added in equal parts. The actual concentration of adrenalin in each experiment is noted in the table.

These two tests resulted as follows:

	CONCENTRATION OF ADDED REAGENTS	PHAGOCYTOTIC INDICES
	per cent	
Glucose	2.00	0.26
	1.00	0.50
	0.50	0.55
	0.25	0.70
	0.10	0.72
Adrenalin	2.0 (0.002)	0.33
	1.0 (0.001)	0.47
	0.5 (0.0005)	0.53
	0.25 (0.00025)	0.79
	0.10 (0.0001)	0.83

Thus, it is seen that both glucose and adrenalin exert inhibitory influences upon opsonic reaction, their activity decreasing in direct proportion to the decrease in concentration. As dilute a solution as 0.1 per

cent glucose or 0.0001 per cent adrenalin still show some inhibitory action.

B. In this series the inhibition by glucose and adrenalin upon the opsonic reaction in the blood of consumptive patients was the aim of the experimentation. To approach the natural conditions as closely as possible, both opsonin and phagocytes were taken out of the patient, and the organisms were used alive. The leucocytes were by previous examination found to contain no bacilli in their cell-bodies.

Method of Observation. Three series of test tubes were set up as follows:

Tube 1. 1 cmm. tubercle bacilli suspension in isotonic salt solution.

Tube 2. 1 cmm. tubercle bacilli suspension in isotonic salt solution + 1 per cent adrenalin (1:1000).

Tube 3. 1 cmm. tubercle bacilli suspension in isotonic salt solution + 1 per cent glucose solution.

These were heated to 38°C. in a water bath, after which 5 drops of patient's blood, drawn out by means of a hypodermic syringe from a vein, were added to each tube. Tubes were again heated for 45 minutes at 38°C. The blood cells sank to the bottom and thus the contents of the tubes divided themselves into two layers. By means of a capillary pipette, the fluid at the junction of the two layers was removed. Cover glass preparations were made and fixed carefully with a mixture of equal parts of alcohol and ether. After staining with Ziehl solution, the red blood cells were removed from the vision by means of acetic acid and decolorization with sulphuric acid. The preparations were finally counter-stained with dilute methylene blue. Blood was taken from the patients always at 10 a.m. or 3 p.m. to avoid complication with meals. The syringe needle used was $\frac{1}{3}$ mm. in diameter, 1000 drops of blood corresponding to 1 cmm., and 130 drops of salt solution to 1 cmm.

The following are the tabulated results of the above test with 60 patients (see table 1):

These data show that. (1) Adrenalin and glucose have a marked inhibitory influence upon phagocytosis in the blood of consumptive patients, and (2) phagocytosis is in general more marked in the less severe cases than in the more advanced ones.

Occasionally advanced cases show a relatively high opsonic index and the less severe cases a comparatively low index. These variations are apparently only coincidences of the time when the examination is made—temporary arrest of unfavorable symptoms in the advanced

TABLE 1

With consumptive patients without glycosuria

CASE NUMBER	SEX	AGE	LESION IN	NUMBER OF TUBERCLE BACILLI IN	DEGREE OF SYMPTOMS	PHAGOCYTOSIS		
						Tube I	Tube II	Tube III
1	Male	37	Right superior lobe (lung)	Sputum 6	Medium	108	70	43
2	Male	34	Right superior lobe + left apex (lungs)	Sputum 3	Medium	138	78	114
3	Female	25	Both lungs and colon	Sputum 7 Stool 1	Advanced	96	49	35
4	Male	32	Entire right lung	Sputum 7	Medium	121	85	91
5	Male	34	Entire right lung	Sputum 7	Advanced	87	23	20
6	Female	37	Right superior and intermediate lobes	Sputum 3	Medium	101	47	68
7	Female	22	Right superior, intermediate + left superior lobes	Sputum 10	Advanced	77	56	62
8	Female	51	Entire left lung	Sputum 3	Medium	55	47	44
9	Male	25	Right intermediate and inferior lobes	Sputum 3	Medium	72	33	23
10	Female	26	Superior lobes in both lungs	Sputum 3	Medium	88	64	55
11	Male	19	Superior lobes in both lungs	Sputum 5	Medium	75	35	34
12	Female	37	Superior lobes in both lungs, and colon	Sputum 7 Stool 2	Advanced	62	29	4
13	Female	19	Right superior lobe and left pleurisy	Sputum 3	Slight	105	48	40
14	Male	22	Right superior lobe and larynx	Sputum 7	Advanced	62	21	52
15	Male	25	Both lungs, larynx, and colon	Sputum 7	Advanced	35	31	8
16	Male	18	Right superior lobe	Sputum 6	Medium	168	75	111
17	Male	58	Right superior lobe + left apex	Sputum 6	Medium	191	127	105
18	Male	26	Entire right lung and left apex	Sputum 7	Medium	159	90	74
19	Female	21	Right superior and inferior lobes and left apex	Sputum 5	Medium	204	116	87
20	Male	38	Right superior lobe	Sputum 3	Medium	164	77	75
21	Female		Right superior and middle lobes	Sputum 1	Medium	95	39	30

TABLE 1—*Continued*

CASE NUMBER	SEX	AGE	LESION IN	NUMBER OF TUBERCLE BACILLI IN	DEGREE OF SYMPTOMS	PHAGOCYTOSIS		
						Tube I	Tube II	Tube III
22	Male		Entire right lung	Sputum 6	Advanced	113	36	27
23	Female		Superior lobes in both lungs	Sputum 10	Advanced	129	49	44
24	Male		Superior lobes in both lungs	Sputum 7	Advanced	74	57	34
25	Male		Entire right lung	Sputum 6	Medium	81	69	51
26	Female		Left superior lobe	Sputum 7	Medium	87	9	10
27	Male		Superior portions of both lungs	Sputum 3	Medium	77	42	43
28	Female		Entire left lung and right superior lobe	Sputum 5	Advanced	92	35	26
29	Female		Entire left lung + right superior lobe	Sputum 7	Advanced	63	61	51
30	Male	43	Superior portions of both lungs	Sputum 5	Medium	65	61	34
31	Female	25	Entire left lung	Sputum 5	Advanced	73	47	33
32	Male	27	Entire right lung + left superior lobe	Sputum 5	Advanced	81	33	23
33	Male	31	Superior lobes of both lungs	Sputum 5	Advanced	69	22	13
34	Female	15	Right superior and intermediate lobes	Sputum 3	Medium	94	39	36
35	Male	42	Superior portion of left lung, and right pneumonia	Sputum 2	Medium	78	51	39
36	Male	25	Entire right lung + left pneumonia	Sputum 3	Medium	91	51	33
37	Male	44	Right pleuro-pneumonia	Sputum 1	Light	81	64	33
38	Male	16	Left superior lobe	Sputum 1	Light	70	39	31
39	Female	33	Superior portion of right lung and left pneumonia	Sputum 1	Light	70	42	13
40	Male	26	Right superior intermediate lobe	Sputum 1	Light	99	66	60
Average						96.175	52.825	45.200
Control (healthy individual)						229.00	51.00	49.00

TABLE 2

*A study of twenty consumptive patients with glycosuria**

CASE NUMBER	SEX	LESIONS IN	NUMBER OF TUBERCLE BACILLI IN	URINARY SUGAR	DEGREE OF SYMPTOMS	PHAGOCYTOSIS		
						Tube I	Tube II	Tube III
				per cent				
1	Male	Entire right lung + left superior lobe	Sputum 8	0.247	Advanced	132 42	97 24	50 25
2	Male	Right superior and intermediate lobes	Sputum 8	0.476	Light	36 13	8 10	39 12
3	Female	Right superior lobe + left apex	Sputum 8	1.120	Advanced	60 22	53 8	66 0
4	Female	Entire left lung + peritonitis	Sputum 8	0.767	Advanced	84 18	79 8	52 9
5	Male	Entire right lung + left inferior lobe	Sputum 8	1.269	Advanced	66 4	39 4	33 3
6	Male	Left superior lobe	Sputum 8	0.192	Medium	44 12	33 0	39 0
7	Male	Both lungs (entire)	Sputum 8	0.350	Advanced	62 22	40 0	31 0
8	Male	Upper left half + entire right lung	Sputum 8	0.100	Advanced	43 27	20 28	27 23
9	Male	Entire both lungs	Sputum 8	0.277	Advanced	57 0	42 0	117 0
10	Female	Entire right lung + left superior lobe	Sputum 8	0.363	Advanced	48 0	60 13	71 18
11	Female	Entire both lungs and colon	Sputum 8	0.308	Advanced	152 47	42 28	11 34
12	Male	Entire left lung + larynx, + right apex	Sputum 8	0.755	Advanced	182 22	76 20	90 28
13	Female	Entire right lung + peritonitis	Sputum 8	0.416	Medium	60 18	130 0	126 0
14	Male	Left superior lobe	Sputum 8	0.290	Light	72 18	44 5	28 0
15	Female	Superior portion of left lung, and larynx and colon	Sputum 8	0.324	Advanced	48 17	22 0	30 8
16	Male	Entire right lung and left pneumonia	Sputum 8	0.300	Advanced	64 23	25 16	44 18
17	Male	Right superior and intermediate lobes	Sputum 4	0.100	Medium	68 35	35 30	30 22
18	Male	Right superior and intermediate lobes	Sputum 1	0.588	Light	103 36	41 18	45 21

TABLE 2—*Continued*

CASE NUMBER	SEX	LESIONS IN	NUMBER OF TUBERCLE BACILLI IN	URINARY SUGAR	DEGREE OF SYMPTOMS	PHAGOCYTOSIS		
						Tube I	Tube II	Tube III
				per cent				
19	Male	Entire right lung + left apex + larynx	Sputum 6	1.250	Advanced	68 22	23 18	18 2
20	Male	Entire left lung, right superior lobe, larynx	Sputum 7	0.542	Advanced	53 27	27 12	30 5
Average						75.10 22.25	46.80 12.20	53.75 11.40

* In the above table in the column labelled phagocytosis, the upper figures show the number of organisms engulfed at the usual time, and the lower show the amount of phagocytosis at a time glycosuria had occurred after emotional excitement. The amount of urinary sugar is that determined shortly before the opsonic examination was made.

cases, causing an increased phagocytosis, and a temporary acute symptom in the lighter cases depressing it. Treated advanced cases show a relatively higher opsonic index than the untreated mild cases.

In addition to the two facts previously noted in table 1, it is shown that at the time glycosuria is present on account of emotional excitement, phagocytosis is decreased, and that an addition of adrenalin or glucose to the test-tube mixture still further decreases the reaction.

In cases 9 and 13, remarkable divergence from the general tendency is obtained, the addition of glucose and adrenalin increasing phagocytosis. No explanation for this phenomenon is as yet available.

DISCUSSION

Previous to the work of Pawlow, Biedl and Schmidt (1852) had noted a pronounced influence exerted by various psychic acts upon the secretory activities of the digestive glands.

Bickel and Sasaki in 1905 had confirmed Pawlow's work. Later Oechsler (1914) demonstrated the existence of a similar relationship between emotional states and pancreatic and biliary secretions. Furthermore, the same was found to hold for the mechanical movement of the digestive organs by Le Conte (1900), Bickel and Sasaki (1905), Fommel (1903), Cannon (1902), Auer (1907), and others. Richet (1878), Hornborg (1904), Cade et Latarjet (1905), Bogen (1907), Laven-

son (1901), and Mueller (1907) clinically demonstrated similar relationships in man.

The period of this reaction of the digestive organs to psychic influences has been known to extend beyond the period of stimulation. Jacobi (1891), Bickel (1897), Dreyer (1898–1899), Tacheboksaroff (1910), Asher (1912), Joseph and Meltzer (1912), Elliott (1912), and Cannon and Lyman (1913), showed that the innervation of the suprarenal glands was derived from the splanchnic nerves. Stimulation of these nerves causes an increase in adrenalin secretion, giving rise to heightened blood pressure and pupillary dilatation. Again in 1910–11 Cannon and de la Paz showed that pupillary dilation in cats was associated with impaired digestion. The cardiac acceleration, and the erection of hair in the back and tail which is associated with fear, may be reproduced by sympathetic stimulation. And after artificial stimulation of the sympathetic nerve which supplies the suprarenal glands, these investigators experimentally demonstrated that the adrenalin secretion is similarly increased by various psychic acts.

In 1901 Blum showed that an injection into an animal of an extract of suprarenal gland brings about an increase in blood sugar and causes gycosuria. Later in that year Takamine, and independently of him Aldrich (1901–1905), isolated the active principle of suprarenal gland and named it adrenalin. With the isolation of adrenalin Straub and Ritzman (1907–1909) showed that this substance, when injected, gives rise to an increase in the sugar content of the blood, and glycosuria. The adrenalin stimulates a decomposition of glycogen in muscle and liver into glycose and, therefore, the condition is similar to the diabetes of sympathetic nervous origin. Subcutaneous injection of 1 to 2 mg. of adrenalin into rabbits brings about a glycosuria after thirty minutes of three hours, the condition lasting from three hours to a day.

In observations recorded in this paper, it was shown that advanced consumptives, especially nervous individuals frequently show transient glycosuria. Cannon proved experimentally the capacity of adrenalin to remove muscle fatigue and also to hasten the coagulation of blood, and considered an adrenalin increase as a beneficial compensatory mechanism. By an increase in the adrenalin secretion the splanchnic and cutaneous vessels are constricted, blood pressure raised, and the blood accumulates in the brain, lungs, heart and muscles of the limbs, preparing the individual for emergencies such as a sudden attack by an enemy. Removal of muscle fatigue and an increase in the coagulability

of blood also are designed for such an emergency. On the other hand, when this increased amount of adrenalin and sugar remains unutilized in the blood it acts injuriously, as pointed out previously, by lowering the opsonic index and thus increasing the symptoms of the disease. Psychic excitations in the tuberculous patients, corresponds to the latter condition. The adrenalin increase and an increase in the blood sugar are caused by various mental activities. These substances impair the phagocytotic action of the blood. What Cannon terms a compensatory mechanism is apparently designed as a temporary means for combating certain situations. The factor calling forth such a compensatory mechanism is itself injurious to individuals, especially when it exceeds a certain limit. Adrenalin and particularly sugar in the blood are inhibitory to phagocytosis, as seen in the experimental and clinical data presented. I am inclined to conclude that the injurious effect exerted upon consumptive patients by psychic excitations is due to the lowering of the opsonic index caused by an increase in adrenalin in secretion and the subsequent increase in blood sugar.

This conclusion is supported not only by the experiments described above but also by the time honored clinical observations of the subnormal resistance shown by diabetic patients towards infections such as tuberculosis and furunculosis. Glycosuria is observed in those tuberculous patients which are advancing and which have a bad prognosis.

It must be borne in mind, however, that the lowered opsonic index is not the sole cause of the decided impairment in the course of the disease. Depression of digestive function by psychic acts, causing the loss of appetite and emaciation, must be considered as an important factor.

The relationships above brought out must hold in cases of healthy individuals as well as in the sick, emotional acts predisposing them to tuberculous and other infections. Hence the problem is important not only to therapy but also to preventive medicine.

According to the statistical returns of our country the individuals of ages between fifteen and thirty-five constitute one-third of the total number of fatal cases of pulmonary tuberculosis. In England (1914) ages between thirty-five and fifty show greatest mortality. In the United States 25 states reported in the same year the highest mortality between the ages of twenty and twenty-five.

In Japan the occupational classification shows the greatest percentage of mortality from consumption among primary school teachers. The

relative number of young individuals suffering from consumption is greatest in Japan. According to the recent investigations by Roemer and Freymuth (1912) the pulmonary tuberculosis seen in early adult life is the reappearance at puberty of the previous infection which had occurred in childhood and was subsequently held in check. This phenomenon was called by them auto-inoculation. Although the accuracy of the statement is open to question, a high percentage of positive von Pirquet tests among the children of our city schools indicates that the infection is acquired in some way similar to the one suggested by these investigators.

Thus it appears that the high death rate from pulmonary tuberculosis among the young individuals in our country is attributable to inadequacy in prophylactic measures against tuberculosis during the school age, the heavy strain on the children by our didactic method of teaching and our peculiar linguistic difficulties, and especially the incomparably severe entrance examinations to higher schools which are necessitated by the insufficiency in the school accommodations. A large number of students become neurasthenic, and some of these neurasthenic youths are virtually forced, upon graduation, to face the high cost of living and low salaries, as school teachers. Thus they fall victims to tuberculosis and then very probably infect the children under their care. An improvement in the educational system and in the treatment of teachers is radically necessary in combating tuberculosis.

CONCLUSIONS

1. Psychic acts frequently influence the course of pulmonary tuberculosis unfavorably and render the treatment difficult.
2. The psychic influences upon the disease are accompanied by a lowering of the opsonic index.
3. Psychic acts often cause transient glycosuria.
4. Sugar and adrenalin both inhibit opsonic reaction.
5. Lowering of the opsonic index in emotional excitement is caused by an increase in the amount of sugar and adrenalin in the blood.
6. Impairment in the progress of the disease is caused both by a decrease in the opsonic reaction and in the digestive function.
7. Overtaxation of the mind of our youths by our unsatisfactory educational system seems to be the cause of the high mortality of young consumptives in our country.

8. The high mortality of our youths from tuberculosis is also partly due to the infection from tuberculous teachers, who in turn are the victims of excessive mental strain.

9. Prevention of excessive mental strain by an improvement in our educational system is one effective means of preventing the spread of consumption among our youths.

The author takes this opportunity to pay his respects to his teacher, Professor Kitasato.

INDUCED PNEUMOTHORAX. ITS USE IN THE TREATMENT OF PULMONARY TUBERCULOSIS

WITH A REPORT OF 202 CASES

EVERETT MORRIS

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There is no therapeutic measure used in the domain of phthisis offering to suitable cases as much justification for confidently anticipating a successful issue as artificial pneumothorax. Before going further, we must define clearly the word "suitable" and take for granted that the treatment be left in experienced or careful hands. The rationale of induced pneumothorax is based on the fundamental principle, rest, and the ultimate result is that sought by every kind of treatment, namely, fibrosis. This paper will be confined largely to my observations of 202 cases treated by myself and other members of the staff at the Cook County Tuberculosis Hospital since November, 1914, this special method being considered at all times only as an adjunct to the accepted hygienic-dietetic regimen of the institution.

The questions first to consider are: What constitutes a suitable case? How long shall we depend only on hygienic-dietetic management? The ideal case physically is a recent progressive, ulcerative, unilateral lesion in one lobe or more (Turban II or III),[1] without marked adhesion formation, the opposite lung being clinically free from pathological change. Unfortunately, this condition is seldom found, although I do not doubt that many cases at some time could have been so classified. Roentgenologists tell us that these "clinically unilateral" cases usually reveal under the Roentgen ray a definite peribronchial tuberculosis, in most cases inactive. With the exception of three moderately advanced cases, all are far advanced in table 1.

[1] Turban's Classification for Tabulation of Individual Cases:

I. Slight lesion extending at most to the volume of one lobe or two half-lobes.

II. Slight lesion extending further than I, but at most to the volume of two lobes; or severe lesion extending at most to the volume of one lobe.

III. All lesions which in extent of the part affected exceed II.

Here I desire to call attention to the rarity of one-sided cases. Early in our experience with artificial pneumothorax, I studied the histories of ninety-six cases in the male receiving wards and found seventeen in which the disease was confined chiefly to one side. Of these only two were selected after careful clinical examinations, the others being rejected either on account of slight activity in the opposite lung or the patient's attitude toward the procedure. Today, I am accustomed to urge every one presenting such findings to take advantage of this special method of treatment.

The next class, and probably the one most often chosen for this treatment, reveals extensive infiltration, consolidation or cavity formation throughout one lobe or more (Turban II or III), with evidence of active

TABLE 1

Unilateral cases

TURBAN	NUMBER OF CASES	SPUTUM		INDICATIONS			AVERAGE NUMBER OF TREATMENTS	DISCONTINUED OR DISCHARGED					RESIDENT		WORKING
		Positive	Negative	Cavitation	Haemoptysis	Effusion		No free space	Activity opposite lung	Left institution improved	Unimproved	Died	Improved	Unimproved	
R I.....	2	2			2		29			1					2
L II.....	4	3	1	4			10		2	1	1	1			
R II.....	3	3		2	1		5			1	1		1		1
L III.....	5	5		4	1		5	1	1	1	2	2	1		
R III.....	14	13	1	12		2	11	3	4	3	1	5	3	[5]2	1
Total.....	28	26	2	22	4	2	12	4	7	7	5	8	5	2	4

infiltration in the opposite apex (Turban I) or its equivalent. My practice has been, until recently, not to recommend the treatment to those whose disease has progressed further than the apex in the good lung. In seventeen instances, air was given with the disease active in more than one-half of the upper lobe (Turban II) of the good lung. In these the border line between utility and danger has to be sharply drawn. In the following table all were far advanced and a great percentage hopelessly ill, except two moderately advanced cases.

Certain cases of acute pleurisy are relieved by the introduction of small amounts of nitrogen gas or atmospheric air into the pleural sac. Most gratifying results may be expected from compression in recurrent haemoptyses otherwise uncontrollable and seemingly hopeless. Fibroid

phthisis, miliary tuberculosis, tuberculous enteritis, and cases with serious heart and kidney lesions should not be selected.

No arbitrary rule can be laid down as to when the treatment should be instituted. After studying our cases, individually and collectively, I am convinced that the average length of residence in the institution, seventy days, before this special treatment is begun, is too long. It is common knowledge in tuberculosis institutions that new patients, as a

TABLE 2

Bilateral cases

TURBAN	NUMBER OF CASES	SPUTUM		INDICATIONS			AVERAGE NUMBER OF TREATMENTS	DISCONTINUED OR DISCHARGED					RESIDENT		REFUSED TREATMENT	WORKING
		Positive	Negative	Cavitation	Haemoptysis	Effusion		No free space	Activity opposite lung	Left institution improved	Unimproved	Died	Improved	Unimproved		
R I..... L I.....	2	2			2		4					2				
R I..... L II.....	15	15		15			8	2	2	7	5	1	1		1	2
R I..... L III.....	74	70	4	64	4	5	10	10	23	8	22	35	6	1	4	1
R II..... L I.....	22	18	4	18	3	1	10	6	5	6	5	5	3	1	1	
R II..... L II.....	3	3		3			1	1		1	1	1				
R II..... L III.....	7	7		5	1	1	4	4		1		4	1			
R III..... L I.....	44	40	4	40	4		8	5	21	6	13	16	4	2	4	1
R III..... L II.....	7	7		6		1	9	2	2	2	2	2	1	1	1	
Total.....	174	162	12	151	14	8	6	30	53	31	48	66	16	5	11	4

rule, do remarkably well for the first few weeks. It may be we doctors are somewhat influenced by this trick in the disease and procrastinate. I admit there are a number of border line cases which are puzzling. In suitable instances, after two to four weeks of sanitarium regimen without marked improvement, I decide in favor of this treatment. In addition to choosing the case from a physical standpoint, there is yet another equally important factor, namely, a desire on the part of the patient for, and a determination to continue, the treatments as long as

conditions require them. The following case report will illustrate what determination on the part of the patient will sometimes do:

Bohemian; female; married; age twenty-six; admitted October 19, 1914. Diagnosis: Infiltration of right upper with effusion; infiltration of left upper (Turban RIII–LI); weight 93 pounds; prognosis, unfavorable

On November 25, 1914, it was decided to institute the compression method on account of the following indications: progressive case, expectorating large amounts of foul-smelling sputum, physical examination indicating right-sided lesion, abscess suspected, slight infiltration in left upper. The case continued to progress unfavorably until after the eighth inflation when she began to gain in weight. On several occasions no free pleural space could be found readily. Twice the procedure was for this reason abandoned for a period of three months by the physicians on the service. Once when the treatments were about to be discontinued she was told by the doctor not to come to the operating room for further treatments, but, in spite of this, she repeatedly presented herself and insisted with such pathos that she be given another trial that the doctor decided the only way to get rid of her was to give her gas. Following this physician's service no gas was given for ninety days, during which the patient ate little, lost ten pounds, expectorated large amounts of foul-smelling sputum, suffered from nausea and violent vomiting, elevation of temperature and acceleration of pulse rate, declined rapidly, and as a result was losing her characteristic spirit of optimism. At this time a diagnosis of lung abscess on the right was made. After much painstaking effort the next man coming in the service succeeded in finding a free pleural space, and since that time no interruptions in the treatments have been allowed. A few days ago she received her 119th refill. Her weight at present is 128½ pounds. The sputum was positive before and only once during the first month of treatment. Since then there have been twenty-two negative reports The patient was recently returned to her home. She is happy and does not hesitate to say, "Gas saved my life."

Induced pneumothorax can be done by means of a very simple apparatus. We have used only the Murphy outfit, with some changes necessitated by the use of atmospheric air instead of nitrogen gas. It might be stated here that the difference, as far as I am able to judge, between the two is $28 per month plus the satisfaction of knowing that no emergency case will suffer for lack of nitrogen. Instead of using the atmosphere in the room, a long rubber tube is connected at one end with the intake valve of an ordinary aspirating pump and at the other with a metallic bathroom spray loosely filled with sterile cotton. This end is placed in the outside air, which is then pumped through a bottle

of sterile cotton, thence into one filled with a 1–1000 bichloride solution, and from this into the inverted cylinder surrounded by boiling water.

The question, should induced pneumothorax be called an operation or a treatment, can be answered. It should be called a major operation, in so far as aseptic technique goes, but the introduction of a sterile needle through the chest wall will hardly justify the use of the word "operation."

In order to conserve time one nurse remains sterile, while another gets the patients into the operating room and takes care of other details.

TABLE 3

Haemoptysis

TURBAN	NUMBER OF CASES	SPUTUM		AVERAGE NUMBER OF TREATMENTS	DISCONTINUED OR DISCHARGED					RESIDENT		REFUSED TREATMENTS
		Positive	Negative		No free space	Activity opposite lung	Left institution improved	Unimproved	Died	Improved	Unimproved	
R I L I	2	2		4					2			
R II L I	3	2	1	2				1	2			
R I L III	5	5		7			2		2			1
R III L I	3	3		4	1		1		1			
R II L III	1	1		3					1			
Total	14	13	1	4	1		3	1	8			1

A physician or nurse operates the apparatus, reads and records the pressures, site of injection and incidents. A certain number of effusions, as a complication in this treatment, can be avoided by observing the principles of aseptic surgery. The needles we use are made by filing the end of an 18 gauge aspirating needle to an angle of 45 degrees. There is also a nick filed into the needle about one-sixteenth of an inch from the end. These are carefully cleansed after use by running cold water and a stilette through them several times in order to remove any coagulated blood or tissue. They are then dried by compressed air, stilettes replaced, wrapped in gauze, three in a package, then covered

with muslin and sterilized under high pressure for one hour. By this means the apparatus is ready for emergencies. A number of needles are kept on hand, which eliminates the procedure of sterilizing between cases. This certainly is a surer method of observing in detail the importance of asepsis. A hypodermic of camphorated oil should be a part of the equipment.

All refills, as well as the initial treatment, must be preceded by thoroughgoing physical examinations. The patient when brought to the examination room is stripped to the waist and placed on the operating

TABLE 4

Discontinued on account of no free space

TURBAN	NUMBER OF CASES	AVERAGE NUMBER OF TREATMENTS	DISCONTINUED OR DISCHARGED			RESIDENT	
			Left institution improved	Unimproved	Died	Improved	Unimproved
R I..... L II.....	2	1		1	1		
R I..... L III.....	10	6	1	3	4	1	1
R II..... L I.....	6	5	2		1	2	1
R II..... L II.....	1	1		1			
R II..... L III.....	4				3	1	
R III.....	3	3	1	1		1	
L III.....	1	5		1			
R III..... L I.....	5	3	1		3		1
R III..... L II.....	2	21	1	1			
Total.....	34	5	6	8	12	5	3

table, without a sand bag under his thorax. A sheet is placed over the body below the waist line and the lateral aspect of the chest cleaned with benzine. Two sterile towels are then placed over the thorax, and the operator, after all preparations have been made by himself as for a major operation, selects the site for puncture by means of percussion and his previous observation of the mobility of different areas of the lung. The site is painted with tincture of iodine, and the operator introduces a hypodermic needle so as to make a bleb with a small amount of 0.5 per cent solution of novocain. After a few seconds the needle is

slowly introduced perpendicularly and the Schleich's infiltration method employed. Care is necessary not to puncture the parietal layer of the pleura. The next step is to pick up the integument surrounding the site, between the left thumb and forefinger with considerable pressure, and with a cataract knife puncture the layers of the skin. Often no haemorrhage follows this pressure method. The left index finger is then placed over the interspace so that its tip almost covers the incision. The needle is held perpendicularly between the tips of the four right fingers and the thumb, while the thick part of the hand rests upon the patient's chest. The needle is then slowly introduced, the index finger

TABLE 5

Discontinued on account of increased activity in opposite lung

TURBAN	NUMBER OF CASES	AVERAGE NUMBER OF TREATMENTS	DISCONTINUED OR DISCHARGED			RESIDENT	
			Left institution discharged	Unimproved	Died	Unimproved	Improved
L II	2	10		1	1		
R III	4	13	1		3		
L III	1	6			1		
R I L II	2	9	1		1		
R I L III	23	8	4	5	13		1
R II L I	5	4	1	1	2	1	
R III L I	21	10	4		8	3	2
R III L II	2	1	1	4			1
Total	60	7	12	11	29	4	4

acting as a guide and the nail as a brake. Occasionally, slight negative oscillations are observed in the manometer when the point of the needle reaches the parietal layer of the pleura, but as soon as the needle passes through this layer into a free pleural sac the suction, or negative pressure, immediately causes oscillations varying between 10 or more to 1 or 2 cm. of water. With such oscillations, or in fact with much less amplitude, we have the assurance that the end of the needle is in a free pleural space and that air may be allowed to flow into it without danger. It is best to wait a few moments in order that the oscillations may become stable before they are recorded and air is admitted. During

the initial operation air should be given at short intervals and no more than 100 cc. at a time, the column of water being watched continuously. When the total number of cubic centimeters have been given, this is recorded along with the readings following. After the needle is withdrawn, the puncture is immediately touched with tincture of iodine and pressure applied by the physician. The wound is dressed with sterile gauze and the patient instructed to continue the pressure for a few moments. By following this method, and by having the patient immediately change position after the needle is removed, very few complications of surgical emphysema are encountered.

The alarming symptoms of pleural shock or air embolism have occurred once. The patient suddenly became unconscious, the respiration irregular, large beads of perspiration appeared on the forehead, and the pulse was rapid and weak. These symptoms disappeared after fifteen or twenty minutes. The treatments were resumed, later, no free space was found. The patient was discharged fit for work. On another occasion the end of the needle entered a blood vessel, as evidenced by blood in the glass cylinder which is four inches from the needle.

The vital part of any apparatus is the manometer, for it registers with exactness the location of the end of the needle. It is to the operator what the compass is to the mariner and a disregard for its danger signals will surely lead to disaster. In addition to a sustained negative pressure with free oscillations, the only condition under which the initial insufflation is warranted, there are other readings of great importance. Fluctuations equidistant above and below zero indicate that the end of the needle is in the lung. The column of water is uninfluenced when the needle is extra-pleural or surrounded by dense adhesions or occluded by tissue or blood. A partial occlusion acts as a valve and the readings are to be interpreted accordingly. When the water rises slowly on the negative side of the manometer, and the pressure decreases slowly without any oscillations during ordinary respiratory movements, the needle is partially plugged. It should be removed and another introduced in the same tract. Failure to locate the free space is often due to coagulated blood. No attempt should be made to introduce the needle as long as there is oozing at the puncture. After some compression is produced the dosage and the necessary length of intervals between refills can be roughly determined by the manometric readings. Some idea of the elasticity of the mediastinum may be also obtained, but not until the pressure approaches zero or becomes

positive. The manometer may confirm the diagnosis of spontaneous pneumothorax.

Here I desire to relate a personal experience, which occurred early in 1915, when I began to treat four cases with large amounts (1200 to 1600 cc.) of nitrogen gas. From these I learned such amounts were unjustifiable. The patients, wisely, either left the institution or refused further treatments. Then I arbitrarily fixed my maximum amount—300 cc. The comfort of the patient, especially after the initial insufflation, his confidence in the operator and faith in the procedure; his coöperation over a long-drawn-out period of time will, in a large measure, be determined by the amount of air or gas given during the first treatment. Small amounts necessarily call for frequent refills, depending on the absorptive power of the pleura. It is our custom to repeat this amount of air twice weekly for three or four insufflations, then to gradually increase the amount until large enough dosage once a week keeps the lung immobile. As the absorption becomes less and the amounts increase, the intervals can be lengthened to meet the need. Hamman states that the normal pleural cavity absorbs about 80 to 100 cc. of nitrogen gas per day, but after a pneumothorax has existed for several months it absorbs from 25 to 50 cc.

It is evident that in the treatment of haemoptysis large amounts of air are necessary without considering the integrity of the opposite lung. In some cases it is frequently not an easy matter to determine the location of the bleeding. On the other hand, in several cases that we were treating by compression, frank haemorrhages occurred in the treated lung and death intervened. Four unilateral cases with haemoptysis are included in table 1, three of which are now working.

In 8 cases of hydrothorax and pyopneumothorax treated by replacing a part of the fluid with air, the results have been palliative only.

The greatest obstacles in the use of induced pneumothorax are pleural adhesions. Dr. Joseph Springer, coroner's physician for the County of Cook, recently told me that out of 17,000 autopsies he had held, 30 per cent of non-tuberculous cases had apical adhesions. This condition obtained especially among alcoholics. In long standing cases of pulmonary tuberculosis we may expect to find the percentage correspondingly increased. It is not uncommon to discover a pocket in the pleural cavity held down by adhesions. These may be broken up by increased pressure, but the danger of rupturing the visceral pleura and

the attending consequences must not be overlooked. Our observations at autopsies have been that if the needle had been introduced, at or near the same site for a number of times, the formation of adhesions had occurred. In six individuals no free space could be found.

A partial collapse sometimes determines the issue in favor of the patient. At the beginning of treatment all symptoms are temporarily increased in severity, but after a few weeks they begin to disappear or diminish, depending on the amount of compression and the integrity of the opposite lung. The dangers incident to the opposite lung are minimized, if guarded by small amounts of air during the early part of the procedure. The usual complication is the activation of dormant foci. I have discovered that râles in the good lung, after several refills, have a predilection for an area between the fifth and seventh ribs in the midaxillary line. Râles in the opposite lung, not autochthonous, are of no consequence. The opportunities for disseminated infection into the opposite lung by aspiration are markedly increased when large amounts of air easily compress the broken down tissue. Success in all cases depends on how the working lung accommodates itself to the new demands made on it. The danger in a voluminous spontaneous pneumothorax is not due to the immobilization of one lung, but to the inability of the opposite lung to almost instantly take care of its complemental duties. Among our unilateral cases activity in the opposite lung sufficient to discontinue the treatments occurred in 2.8 per cent; in the bilateral, 30.7 per cent.

In addition to the loss of many distressing symptoms, due to lessened autointoxication, the conversion of an open case into a harmless one is of great importance, especially if the length of residence in an institution is limited. In our series 14 cases were negative prior to the first inflation, of these 10 became positive during or after the treatments, 1 died, and 3 were discharged. The only other negative case not tabulated in this report proved at autopsy to be pneumokoniosis. Twelve open cases became negative and remained so after the first operation. Of these, 1 is in the Italian army and 2 are at work. Many were alternately negative at monthly laboratory examinations.

In 2 hopeless cases spontaneous pneumothoraces occurred after the first and tenth treatments, and both terminated fatally. We have found the compressed lung gangrenous in 1 case which came to the autopsy table.

Of the 197 far advanced cases 65, excluding those in table 3, received

treatments less than one month, and only 15 had, before this method was begun, apparently a favorable prognosis under strict hygienic-dietetic regimen. All of those now classified as working or improved, however, were not in this class. In our tables we have placed only those working who have been restored to an economic efficiency equal to that before breaking down from tuberculosis. One is at the head of a family of six, works nine hours as a cabinet maker, has lost no time since leaving the institution ten months ago and his wages are $19.50 per week. For thirty-four months he has been receiving treatments. He now returns for refills every thirty days. One is working regularly as a cloth inspector at wages of $20 per week. One has been keeping books for eight months, is symptomless; wages, $22 per week. One, a maid, working fifteen months; no evidence of any trouble. One is a member of the 5th U. S. A. Cavalry. One is in the Italian Army. One is a sales-woman, earning a satisfactory wage. One, a chauffeur, union scale wages. Twenty-nine are residents, of whom 21 are improved and 8 unimproved. Among the improved 9 continue to receive refills. One, whose lung is almost collapsed, is now on one hour and forty-five minutes graduated exercise, practically symptomless and will, barring the unforeseen, be discharged fit for work. One was about ready for discharge when overtaken by a "flare-up" in an old lesion in the opposite lung, the result of too much excitement and exercise incident to a bazaar given by the patients. Her chances for becoming a bread winner are probably better than 60 per cent. One has about an equal chance to become a producer, 4 may be restored to a limited degree of usefulness, while 2 are enjoying a life extension period. One, apparently hopeless, in whom treatments were discontinued on account of no free space, is now enjoying life. He furnishes a good example of a number of cases in whom no compression could be discovered by the Roentgen ray, but who show marked improvement, probably due to the psychic effect. Of those discharged improved, one entered another institution and is counted among those working in table 2. In a letter just received one patient writes: "I expect to get through a business course in April. I almost forget that I have been sick." Another is improving in a western city, but continuing treatments. Another became pregnant, had a therapeutic abortion performed, and when last seen was apparently no worse for the experience. Recently she joined her husband in China. The abscess case and the one having pleural shock have already been reported.

DEDUCTIONS

Success in the use of induced pneumothorax in the treatment of pulmonary tuberculosis depends on the selection of cases not hopelessly ill.

A partially collapsed lung often spells reasonable health and sometimes earning capacity.

Usually the part of the lung first to collapse is healthy.

The manometric readings must be correctly interpreted.

Small amounts of air or gas are indicated at the beginning of this therapeutic measure.

Refills must be given systematically and in increasing amounts.

It is safer to keep a lung compressed too long than not long enough.

Proportionately, more unilateral cases with haemoptysis are at work than any other class.

Although our report has brought out nothing unusual in figures, it is impossible to estimate the joy and satisfaction that this coördinated method in treatment has brought to many.

(To Captain Blaine and Doctor Turley, roentgenologists at the Cook County Hospital, and to the members of our staff, I desire to express my appreciation for their assistance).

ARTIFICIAL PNEUMOTHORAX AND PREGNANCY[1]

S. A. SLATER

From the Grand View Sanatorium, Oil City, Pennsylvania

Since 1911 artificial pneumothorax in the treatment of advanced pulmonary tuberculosis has been employed extensively in America with growing popularity. The method of treatment has been used on many cases as a last resort with wonderful results, either prolonging life or restoring patients to comparatively good health. Practically every physician using it has got most encouraging results in some of his cases, while in others he has no doubt been disappointed. It is a form of treatment that cannot be offered to every patient and, while there are comparatively few cases suited for the operation, most of us will grant that its use has saved many lives otherwise doomed, and that it is a most valuable agent in the treatment of tuberculosis.

While there are a few physicians who do not believe in its use, their attitude is unwarranted when it is possible to obtain the results as the literature on the subject would indicate; and he who fails to use it often denies his patients a means of prolonging their lives. If we knew infallibly the kind of case to select, when to begin treatment, and how to avoid complications, we should obtain very much better results than have been possible in the past. Complications have always been frequent and many cases undergoing treatment present complications of a pathological or physiological nature. It is a physiological complication (pregnancy) which we are to consider in this paper.

Pregnancy has always been looked upon as a serious complication of tuberculosis and many patients trace their first symptoms to the time of pregnancy or immediately following labor. Many arrested cases of tuberculosis do well until they become pregnant, but go down rapidly following labor and often enter an untimely grave.

Pregnancy occurring during pneumothorax treatment has been very rare—at least very few cases have been reported in American literature as far as I have been able to discover. At the mid-winter meeting of

[1] Read before the Clinical Section of the Fourteenth Annual Meeting of the National Tuberculosis Association, Boston, Massachusetts, June 8, 1918.

the American Sanatorium Association in 1915, Lloyd reported a case where the patient became pregnant while undergoing the treatment. No other physician present at this meeting had had a similar experience. In a recent personal communication Dr. Lloyd tells me that the treatment continued only until the middle of the sixth month of pregnancy, when it was discontinued on account of pressure symptoms. He states that patient did well until after an uncomplicated labor and for a few days following it but soon had a flare-up. One year later she returned to the sanatorium with her lung completely expanded and containing a large cavity, and also with extensive involvement of the previously good lung. The patient has since died.

Greer (1) mentions the fact that pregnancy is not a contraindication to the use of artificial pneumothorax. Whether he had used it during pregnancy or not he does not state.

Minor (2) mentions a case as undergoing pneumothorax treatment, "living a normal family life and as having borne a healthy child." Other than the above he did not give any of the details.

Vornveld (3) urges the induction of pneumothorax when a woman with active pulmonary tuberculosis becomes pregnant. He mentions one of Forlanini's patients who became pregnant after undergoing treatment eighteen months. The pneumothorax was maintained throughout pregnancy and lactation which passed as under normal conditions. Combiasso in 1914 and Real in 1913 reported somewhat similar cases.

Vornveld started pneumothorax treatment on a woman six months pregnant with good results, the labor and lactation proceeding as under normal condition.

The case occurring in my own practice which I wish to report has been pregnant twice since pneumothorax treatment was begun. The first pregnancy ended in abortion at three months. The second ended at full term in normal labor and without any interruption of the pneumothorax treatment.

Case 448. Italian. Housewife. Age, twenty-six years. Entered sanatorium, December 14, 1913.

Family history. Negative.

Past history. Patient was always healthy with exception of present trouble. Married at age of eighteen. Mother of two healthy children, and had had two miscarriages. She gave a history of a pulmonary hemorrhage five years before admission to sanatorium, but other than that presented no other symp-

toms of tuberculosis until September, 1913, when a cough developed and she began losing weight. Following the cough other symptoms developed rather rapidly and when she entered sanatorium, December 14, 1913, she had considerable cough with a profuse expectoration, containing bacilli, had lost weight, and presented other symptoms of rather active tuberculosis. Examination showed impaired resonance over entire right lung front and back, and subcrepitant râles of a moist nature throughout entire lung. Scattered areas of infiltration through left lung with definite râles in region of nipple. Pneumothorax treatment was considered soon after patient was admitted, for with rest in bed the temperature was usually from 100 to 101°F. at some time during the day, but on account of definite lesion in the region of the left nipple it was thought best not to attempt it. The patient remained quiet in bed from December 14, 1913, until March 27, 1914, without showing any improvement but gradually losing ground. On above date she had two hemorrhages which brought about a decision to collapse the lung if possible. The operation was successful and all bleeding immediately controlled. Following the second injection, three days later, the sputum cleared up completely and temperature dropped to normal and remained so. The treatment has been continued until the present time. On August 29, 1915 she was discharged from the sanatorium free from symptoms and weighing more than ever before, having gained 20 pounds while undergoing treatment. Since leaving the sanatorium she has been doing her own house work, but has continued the pneumothorax treatment, returning every four weeks for a refill.

About one year after returning home she became pregnant but aborted at the third month. There seemed to be no untoward effects as a result of the pregnancy and abortion, and the patient continued to do well. Early in the spring of 1917 when she returned for pneumothorax treatment she stated she had not menstruated. The reason for it was not hard to decide but the pneumothorax treatment was continued. On October 22, 1917, she passed through a normal labor, giving birth to a well developed child weighing seven and a half pounds. The child was immediately removed from the mother and the pneumothorax treatment continued without interruption with the result that both mother and child have done remarkably well. The patient has now been undergoing treatment for over four years, having had sixty eight injections, the last being administered less than a week ago.

When it was found that the patient was pregnant it was a matter of deciding just what course to pursue. The question naturally presented itself whether the treatment should be continued. Here was a patient whose lung had been collapsed for three years and who was in apparently normal health. Which course would offer more to mother

and child? Without some definite indication for discontinuing the treatment other than the pregnancy, it was decided that to continue it would offer the best chance for the mother and prevent a possible break down following labor. The question might be asked how much greater chance would there be of a miscarriage under the treatment than if it were discontinued? It is true that the patient had previously aborted while undergoing treatment, but it could hardly be attributed to that cause as she gave a history of having had two abortions before entering the sanatorium. The patient did not suffer any more inconvenience, after taking gas, during pregnancy than at any other time, and no definite indication arose to cause the treatment to be discontinued.

When everything is considered, one can feel reasonably sure that the patient did much better going through pregnancy and labor with the lung collapsed than if it had been allowed to reëxpand. Certainly, to think of following the same course in every case of pregnancy occurring during pneumothorax treatment is out of the question, for each case will have to be considered individually, and treated accordingly. The one thing that is evident is that it is possible to carry the treatment out in suitable cases with benefit to both mother and child as was evident in this case. Pregnancy in itself is not an indication for discontinuing the treatment.

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ARTIFICIAL PNEUMOTHORAX IN TUBERCULOUS PNEUMONIA

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Judging from the reports in the literature, tuberculous pneumonia has not been treated by artificial pneumothorax, except in a few cases.

Riviere has seen these cases occasionally settle down to a quiet chronic process and he reviews the history of cases of different observers including one case of his own.

The following case which came under my observation at the Texas State Tuberculosis Sanatorium would seem to indicate that we should use this method of treatment more often in these acute tuberculous infections:

C. W., male, age fifteen, clerk, entered the institution April 4, 1918. Mother died of tuberculosis when patient was six years old. Previously had typhoid fever and malaria.

Present history began with a cough which gradually increased in severity and became productive, sputum averaging three ounces daily of a mucopurulent character, and bacteriologically positive for tubercle bacilli. Weight, 114 pounds; temperature; 102.6°F.; pulse, 110.

Physical examination showed a few scattered râles in the right lung. The left lung was flat from the seventh dorsal vertebra downward without fremitus. Auscultation showed absence of breath and voice sounds at the base from the seventh dorsal vertebra downward and numerous moist râles in the upper part.

Patient was observed for a few days and was placed in bed absolutely at rest but without any improvement in the symptoms. At this time the sputum became tinged with blood, which from the history was for the first time. Blood examination at this time showed 80 per cent haemoglobin and red cells numbering 4,416,000 per cubic millimeter.

As there was a possibility of a sacculated fluid at the left base we aspirated without positive results.

The manometer showed a free pleural space with negative pressure. We injected 350 cc. of air and two days later, April 27, we injected 300 cc. and followed it up with 350 cc., April 29; 500 cc., May 1; 450 cc., May 4; 700 cc.,

May 11; 400 cc., May 18; 400 cc., May 23; 400 cc., June 1; 500 cc., June 8; 650 cc., June 17; 650 cc., July 2. We gave iron citrate hypodermatically every other day during the pneumothorax treatment. The cough and expectoration began to diminish gradually following the first few inflations and the temperature immediately dropped to normal, where it has remained since with a few exceptions of a fraction of a degree elevation.

Cough and expectoration are absent, haemoglobin is 85 per cent and red cells number 6,000,000 per cubic millimeter. Patient walks to meals. Physical examination shows complete collapse of left lung and slight displacement of the heart to the right. Right lung is apparently inactive. Weight, 125 pounds.

In considering this case we felt that the pathological condition did not offer a mechanical barrier to complete collapse and stoppage of lymphatic circulation. Furthermore this infection did not follow a pulmonary haemorrhage but did probably follow an eruption of numerous caseous tubercles into the bronchial tubes of the left side from which, by gravitation and aspiration, the bacilli were scattered in all of the alveoli of the lung at the base. As a prophylactic measure it seems that postural treatment to favor drainage would be a logical procedure in all ulcerative cases and especially in those bed cases with profuse expectoration. I want to thank Dr. McKnight and Dr. Knowles for advice, coöperation and assistance in this case.

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MEDICAL NOTES, ABSTRACTS AND REVIEWS

It will be the eventual purpose of the REVIEW thoroughly to canvass all literature on tuberculosis as it appears in other medical periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the Abstract Editor, Dr. George Mannheimer, 41 West 51st Street, New York, N. Y.

Pulmonary Tuberculosis. — Merklen classifies in four groups the men suspected of tuberculosis. His classification is based on the existence or lack of parallelism between the local and the general symptoms, and on the analogy between the objective symptoms in the course of stationary and of progressive tuberculous lesions from parenchymatous congestion, with or without bronchiolitis. The first of the four classes comprises the men with parallel general and local findings; the second those with general but slight or no local findings. Those with slight local findings are kept for closer examination. In the others the diagnosis is evident at a glance. The third group comprises the men with slight or no general symptoms but characteristic local findings. This group also requires prolonged study. It includes the numerous cases of tuberculosis developing by *petites poussées évolutives*. This method of evolution by waves is the explanation of the discrepancies so often noted between the man's clinical record and the findings of the moment. His disease progresses by a succession of phases of aggravation and improvement. The aggravation may be in the tissue modifications or in the toxemia, so the general symptoms or the local manifestations may predominate at different times, and the phase of improvement may reach an actual cure by sclerosis. Or these "pushes" may be slight and brief, and a somewhat prolonged study of the case may be required to demonstrate them. His fourth and last group comprises the cases of tuberculosis with an atypical course, recurring bronchitis, persisting congestion of the lung, chronic bronchitis with emphysema, febrile episodes. The diagnosis of the bacillosis may be very probable even at the first examination, but it generally requires confirmation. He describes further the interpretation of the radiologic findings, and discusses the numerous cases of pulmonary tuberculous lesions arrived at such a phase of healing and torpidity that in the conditions of ordinary life they never would be heard from. But with stress of active service the men grow thin and tire easily, complain of diffuse pains, and lack of appetite, and they get out of breath after exertion, but there is no cough or expectoration, and the temperature and pulse are normal. Conditions improve materially under repose, and they do not improve without it. Work or fatigue brings them back again.—*Notes sur quelques donnces importantes en matière de la tuberculose pulmonaire, P. Merklen, Presse Méd., May 23, 1918, xxxvi, No. 29, 262.*

Tuberculosis and Syphilis.—In order to impress the importance of the use of the Wassermann test in tuberculous patients the cases in the Alameda County Tuberculosis Clinic during the past four years were studied. The Wassermann tests were made at the State Hygienic Laboratory in Berkeley. In all cases the sputum examinations confirmed the diagnosis of tuberculosis. Four years are included, 1914 to 1917, during which 195 cases received Wassermann tests. Summing them up for the four years, in 17, or 8.7 per cent, the reaction was positive. This represents what would have been overlooked by the average practitioner when treating open cases of tuberculosis of the lungs without making the Wassermann test.—*Tuberculosis and Syphilis, E. v. Adelung, J. Am. M. Ass., April 27, 1918, lxx, No. 17, 1211.*

Tuberculosis and Gassing.—It is of comparatively frequent occurrence that a man, who has been gassed and had apparently thrown off all the ill effects, develops infarcts and hemoptysis from congestion later, showing hemorrhagic inflammatory lesions in the lungs. In two cases described in detail there had never been any signs of tuberculosis before in one case; in the other an old process had evidently flared up anew. In this case the prognosis is grave, but the other patient seems to be overcoming the disease and improving.—*Gas asphissianti e tubercolosi pulmonare, E. Tedeschi, Rif. Med., January 5, 1918, xxxiv, No. 1, 2.*

Ocular Tuberculosis.—The following points are emphasized: (1) The spread of tuberculosis is generally by means of the lymphatics, while the bloodstream transmits the toxins and sometimes the tubercle bacillus. (2) In considering the diagnosis of tuberculosis careful attention should be given to the lymphatic system, and especially the cervical and bronchial glands as latent foci. (3) The tuberculin test is of great importance; the reaction in the eye should be watched for after each injection and the endeavor should be made to use the smallest dose that will produce a reaction. (4) The treatment should be general as well as with tuberculin.—*Tuberculosis of the Eye, P. H. Pierson, Cal. State J. of Med.; February, 1918, xvi, No. 2.*

Asthma and Tuberculosis.—Asthma is not always a diffuse process but often limited to a small area in one lung. Although the signs may be localized the symptoms may be localized or general. Whether primarily or secondarily infected the first evidence of pulmonary tuberculosis is an enlargement of the bronchial glands. Their enlargement is a part of the normal mechanism for the battle against the disease. It is through their functioning that antibodies are manufactured. When the person is enjoying good health the glands are not interpreted as a tubercular focus; it is only when the person is below normal that they are considered as of potential or possibly actual danger. In this latter type of a person the glands are swollen and more actively diseased. Their presence irritates the adjoining bronchi, setting up a low grade inflammation which may become the seat of secondary infection. These factors may start the vicious circle for an asthmatic condition. This condition may occur during childhood or later life and may irritate one bronchus and hence one lobe, or one lung or both lungs. This is a very important factor in properly interpreting localized asthmatic breathing. From the glandular condition slowly or rapidly develops a peribronchial fibrous thickening extending outward toward the periphery. This may involve one lobe much more than another. All this time the person is manufacturing antibodies, and if these are sufficient the disease remains confined and not actually dangerous. If the scale turns against the person in this struggle, there may occur a breaking down of the glandular or lymphatic elements at the hilus or nearer the periphery and a focus start in the lung tissue. Again depending on the location and also on the extent of the process, one or more lobes may be involved by an irritating process in a bronchiole and a factor established for a possible localized asthma. The tuberculous disease may not break down so as to invade the smaller alveoli but it may cause a chronic inflammatory process in the bronchioles on which is developed a secondary infection. The possible tuberculous etiology for this secondary infection must not be overlooked in such instances. From this survey and working on the "nonpassive expiratory theory," it can be explained clinically and pathologically that localized foci of tuberculosis may, and from experience do, actually set up a localized or general asthma.—*Interrelationship of Asthma and Tuberculosis P. H. Pierson, Cal. State J. of M., June 1918, xvi, 254.*

Miners' Consumption and Pulmonary Tuberculosis.—The special tendency of certain occupations to cause disease has long been known, but it is only within comparatively recent times that the subject has received sufficient serious thought to lead to careful study and the institution of preventive measures. All vocational diseases reduce individual efficiency, the efficiency of the work at hand, and the general well-being of the community, and it is evident that the cost of sickness is far greater than the cost of installing protective mechanisms. This, indeed, is now the stand taken by most large and progressive employers. Miners' consumption has, however, a special sanitary interest because the disease is confounded with actual pulmonary tuberculosis, and because, in fact, it is so often accompanied by pulmonary tuberculosis. The likelihood of the sufferers transmitting the disease to those who have a special susceptibility to it because of the damage to the lung tissue by the mine dust becomes a general health menace. But although often mutually complicating and frequently accompanying each other, miners' consumption and pulmonary tuberculosis are not identical; indeed, they need never occur together. But in the terminal stages of miners' consumption pulmonary tuberculosis is so common that they may then be considered identical.

Miners' consumption is essentially a fibrosis of the lung tissues, the result of irritation of the lung by the dust particles. In consequence of this fibrosis there is a reduction of the alveolar cells with a proportionate reduction of the air space of the lung. The ever-present dyspnea is then a natural consequence. More particularly, pneumonoconiosis is a chronic interstitial inflammation of the lungs, more marked in the apices, but present almost anywhere in the lung to marked degrees. The lung

may even be almost entirely filled with fibrous nodules, each having embedded within it some of the dust particles causing the fibrosis. The surrounding lymph glands are similarly affected, the dust particles being brought to them by the leucocytes. It is evident that tissues so profoundly affected by foreign matter make a good field for the development of other infections, and tuberculosis is the most common of them. But except in the more advanced conditions these patients look well, whereas in lesser degrees of simple tuberculous involvement the patients would be in much worse physical condition. Pain is very common in miners' consumption as a result of the mechanical irritation of the finer bronchial tubules by the dust particles. Neither is loss of weight marked in miners' consumption except in the terminal stages. However, when the cough is very marked it usually means an infection with tubercle bacilli. In any case, the sputum is usually loaded with the dust particles and is colored in accordance with the particular kind of mine dust it contains. But in pneumonoconiosis, even in advanced cases, there are few, if any, physical signs. Physical examination of these patients is in itself insufficient to establish the diagnosis, without the assistance of the history of the predisposing occupation. Very often even patients who have a complicating tuberculosis in which the sputum is positive for tubercle bacilli will present no physical signs of either disease. Usually tuberculous infection is a terminal condition, but when it occurs earlier it forces a more rapid downward progress of the disease than would occur without this complication. In miners' consumption with the tubercle complication it can never be said that the tuberculosis of the lungs is incipient. It assumes immediately the far advanced stages. Ordinarily the incipient stage of pulmonary tuberculosis is drawn out. Here its length is a negligible quantity, and the outlook for the patient is hopeless. The tubercle infection may arise from an outside source acting upon injured lung; or the tuberculosis may be a reawakening of a dormant focus.

The form of diseases included under the term miners' consumption includes all pulmonary fibrosis caused by the injurious effect of dust particles. Mine workers, marble polishers, and the like, are all subjected to the same conditions and likely to contract this disease. Unless there is a concerted move to control the conditions causing the disease by employee and the community, many more individuals must be affected as these industries continue to develop. Most health authorities make vocational diseases reportable, and legislation is even at present seeking to control the evil.—*Editorial, Med. Rec., June 1, 1918, xciii, No. 22, 952.*

The Results of Pleural Effusions.—One hundred and fifty-two cases of pleural effusion of different natures, haemothorax and pyothorax following wounds of the chest, empyema following pneumonia, and tuberculous sero-fibrinous pleurisy were studied clinically and radiographically at periods varying from a few months to many years after their onset to determine what permanent changes resulted from such pleurisies.

The following conclusions were drawn:

1. Simple haemothorax due to wounds generally leaves no trace.
2. More extensive serous haemothorax in undergoing organization may leave adhesions between the parietal and visceral pleura, but this is the exception.
3. Pyothorax consecutive to penetrating wounds or pneumonia leaves limited adhesions.
4. Tuberculous sero-fibronous pleurisy is more apt to leave extensive adhesions.
5. Clinical examination enables us to suspect these adhesions, but the X-ray is necessary to determine their extent and their influence on the respiratory function.

From a military standpoint it may be said that these patients in general are not suitable for service as their respiratory function is impaired and their disability is permanent.—*Recherches cliniques et radioscopiques sur les sequelles lointaines des épanchements pleuraux (traumatiques et spontanés) M. Pehu et M. Daguet, Ann. de méd., July and August, 1917, iv, No. 4, 428.*

Erosion of Aorta by Cold Abscess.—In the case here described the abscess arising from a tuberculous spondylitis took a very unusual course. A soldier, twenty-two years old, previously healthy, was admitted with profuse haematemesis. After thirty hours' stay in the hospital he succumbed to another hemorrhage from the stomach.

Autopsy. On the anterior surface of the second to sixth dorsal vertebra a multilocular cavity; the vertebrae devoid of ligaments, periosteum and corticalis; the marrow greyish green, mushy. The anterior wall of this cavity is formed by the oesophagus and aorta. On the left lateral wall of the oesophagus 9 cm. below the posterior commissure of the larynx there is a sharp-edged ulcer, 10 by 5; another larger one further down. Both ulcers are connected by a bridge of mucous membrane 2 cm. wide. On the posterior aspect of the descending aorta the intima is greenish

black for 15 mm. and a slit like opening leads into the abscess cavity. The left lung is totally adherent. Anatomical diagnosis: abscess in posterior mediastinum with perforation into oesophagus and aorta; erosion of spine; death through hemorrhage. In smears from the pus staphylococci, streptococci and diplococci with capsules. Microscopically: in the vicinity of the ulcers the layers of the oesophagus are filled with tubercles and a few tubercle bacilli are found. The aortic walls are necrotic without specific granulation tissue.

The cold abscess perforated the oesophagus and was infected there. In conjunction with pus germs it destroyed the wall of the aorta. This would probably have led to miliary tuberculosis or to sepsis, if the fatal hemorrhage had not forestalled it. From a review of the literature the old teaching still holds good that large arteries are pretty immune to tuberculosis.—*Arrosion der Aorta durch tuberkuloesen Senkungsabscess, K. Schnyder, Corr. Bl. f. Schweiz-Aerzte, May 18, 1918, xlviii, No. 20, 655.*

Mitral Stenosis and Pulmonary Tuberculosis.—Burnand comments on the three aspects of this connection, namely, (1) that mitral stenosis tends to protect the lungs against tuberculosis by the chronic stasis which it induces; (2) that mitral stenosis is often of tuberculous origin, and (3) that mitral stenosis may induce a set of symptoms in the lungs deceptively stimulating those of tuberculosis. These three conceptions are less contradictory than they appear at first. The third type may be the result of the impeded circulation in the lungs associated with some minute and latent tuberculous apical focus. In a case described in detail the young man with mitral stenosis had been always frail, and suddenly he had a profuse hemoptysis (1 liter) but there was no cough or expectoration. A few months later there was another hemorrhage, after exertion, and this time there was fever for ten days. The course of the case confirmed the assumption of congestive tuberculosis of the lungs with no tendency to destructive processes. Burnand reports further six cases of pure mitral stenosis with a similar mild fibrous tuberculous process at one apex; two cases in which the tuberculous process developed with a somewhat graver course, and three cases of mitral stenosis and insufficiency with a mild apical process. All but two of these eleven patients were women. Only three had a history of acute articular rheumatism. Nearly all the others had an inherited tuberculous taint, and some had previously shown symptoms of tuberculosis, but in all but two the tuberculosis had always maintained a mild attenuated character, inflammatory, never destructive. Hemoptysis was the most constant and striking feature of the cases.—*Note sur les rapports du retrecissement mitral avec la tuberculose pulmonaire, B. Burnand, Rev. méd. de la Suisse, Rome, March, 1918, xxxviii, No. 3, 182.*

Tuberculosis of the Stomach.—A man forty-two years of age had stomach symptoms for two years before coming under observation. He had been operated six months previously, the condition being pronounced inoperable carcinoma. The predominant complaints were heaviness in the epigastrium, severe vomiting after meals; later, regurgitation, and emaciation. He had neither pain nor superacidity, but rather subacidity and was always hungry. Hemoglobin 70 per cent. Roentgenologic report; operable carcinoma of the stomach. At operation, during which one-third of the stomach was removed, a tumor was found near the pylorus; there was marked spasm but no dilatation. The lesion consisted of three ulcers with ragged edges and dirty rough bases. Microscopic sections revealed typical tubercles with giant cells with tubercle bacilli in the depth of the ulcers. No spirochetae could be found. The lymph nodes in the section were enlarged, of yellowish-brown color, and contained tubercles and giant cells. Three sputum examinations were negative. The von Pirquet and Wassermann were likewise negative. The patient died eleven days after operation; clinical cause of death: pneumonia. Necropsy revealed pleural adhesions around the apices, and a recent fibrinous pleurisy over the lower right lobe. At the left apex was an area of old tuberculosis measuring 5 by 7 by 5 cm. consisting of fibrosed, dry and caseous tubercles. Various stages of tuberculosis were found through the remainder of the lung as well as through the lower lobe on the right side. The peribronchial lymph nodes were enlarged. The intestine was free from tuberculosis but the lymph-nodes in the gastro-colic omentum and those behind the peritoneum in the region of the stomach were enlarged. In an exhaustive review of the literature on the subject the author finds that tuberculosis of the stomach presents six types of lesions: ulcer, single or multiple, which is by far the most common type; miliary tubercles, usually associated with miliary tuberculosis elsewhere, but rarely found also associated with chronic pulmonary tuberculosis; solitary tubercle, in one case without demonstrable disease elsewhere; pyloric

stenosis, the obstruction being produced by fibrosis around the ulcer, or, more commonly, by fibrosis secondary to an extragastric tuberculosis; tumor or nodule, caused by connective tissue overgrowth or by atypical glandular growth; and lymphangitis, associated with tuberculous glands or tuberculous colitis. In a critical survey of the cases reported in the reviewed literature the author finds 49 cases which may be classed as positively tuberculous; 118 as probably tuberculous; 59 as doubtful; and 80 as not tuberculous. Of the 49 cases classed as positive, 33 were adults, and in four the age was not given. Twenty-four were males and in 11 the sex was not given. In 40 cases were found ulcers, of which 14 were single and 19 multiple; the others being associated with miliary tubercles, carcinoma, and nodules. The predominant site was the lesser curvature, next the greater curvature, pylorus, posterior wall, and cardia in the order named. In 34 cases the lungs were involved, in 5 not, and in 10 the condition of the lungs was not given. The intestines were involved in 29 cases. Three were associated with carcinoma. The author believes that only two of these 49 cases were primary in the stomach.—*Tuberculosis of the Stomach, with Report of a Case of Multiple Tuberculous Ulcers, A. C. Broders, Surg., Gyn., and Obst., November, 1917, xxv, 490.*

Tuberculosis of the Cecum.—Tuberculosis of the cecum is practically a primary affection. In its earlier stages it may be diagnosed as acute appendicitis or tubercular peritonitis, in its later stages as appendicitis with inflammatory exudates or abscess formation, in its terminal as carcinoma. The pathology is constituted by ulceration of the mucosa, hyperplasia of all the layers and especially the peritoneal covering, and terminal cicatrization with stenosis. The tumor mass is not usually adherent. Excision offers an excellent prognosis if not undertaken too late; before metastasis is general and before obstruction supervenes.—*Tuberculosis of the Cecum, J. W. Sluss, J. Ind. State M. Ass., March 15, 1918.*

Tuberculosis of the Appendix.—Tuberculosis of the appendix occurs more frequently than is generally recognized. About 0.5 per cent of all appendices removed surgically are tuberculous. There are three forms of this disease: miliary, ulcerative, and hyperplastic. The lesion may be primary or secondary to tuberculosis elsewhere in the body. The primary form is extremely rare, but in this type the prognosis is favorable, whereas in other types, except the hyperplastic, it is very unfavorable. The diagnosis rests on afternoon temperature, progressive losses of weight, night sweats, pain and tenderness in the right lower quadrant. The treatment is operative whenever possible.—*Tuberculosis of the Appendix, J. R. Scott, Ann. of Surg. December, 1917.*

Tuberculous Ascites.—Gelpke warns against removing recent tuberculous effusions. All the patients operated on for tuberculous peritonitis within two months of its apparent onset have died, in his experience with 100 cases, and similar evil experiences have been reported by Thöne at Göttingen and from the clinics at Berne, Tübingen, Bonn and Heidelberg, all the patients dying sooner or later after the operative intervention. Clinical observation and animal experimentation seem to render it highly probable that fresh tuberculous effusions contain some curative agencies. Only the old effusions, from three to five months old, should be removed. After they are removed there follows spontaneously a new, curative effusion. At least this is the view now held by many clinicians, and to which Gelpke has been converted by his experiences since 1896 in over 100 cases.—*Zur Frage des Wesens und der Bedeutung des tuberkulösen Asciles, L. Gelpke, Corr. Bl. f. Szhweiz-Aerzte, January 12, 1918, xlviii, No. 2.*

Secondary Tuberculous Peritonitis.—Tuberculous peritonitis is not a primary disease, but is secondary to some local focus of infection, the removal of which is desirable or essential. He calls special attention to the female genitalia as this local focus, and especially to the good effects in some cases of the removal of the fallopian tubes, which are usually open in tuberculosis. This is different from the condition that exists in gonorrheal infection, in which the fallopian tubes are closed and pus tubes are frequently formed. In tuberculosis tubal retention is much less common and the tuberculous infection passes out into the abdominal cavity, causing a more or less generalized peritonitis. Such peritonitis is essentially a conservative process leading to the destruction of the noxious agents and the case may cure itself or a cure may follow simple laparotomy. The way the tuberculosis develops in the tubes is due to the susceptibility of their ciliated epithelium like that of the pulmonary tract. Removal of the tubes may be expected to cure unless some other incurable tuberculous lesions

coexist. It is not at all necessary to remove the ovaries or the uterus. Barker estimates that 50 per cent of cases of tuberculous peritonitis are due to the bovine germ, and approximate estimates have been made by English and German observers. It may be that bovine tuberculosis has a more favorable prognosis than human tuberculosis. The possibility of cure of tuberculosis by simple laparotomy when the local focus cannot be discovered and removed is limited to the ascitic forms of the disease, but the surgical profession has been over enthusiastic in regard to the simple operation. The fibroplastic types are benefited only if there are sacculations containing fluid; but operation is contraindicated when the adhesions fill the entire abdomen. The English school has strongly advocated drainage after laparotomy for peritonitis, but it has been almost abandoned in this country on account of the mixed infection liable to follow. Mayo briefly discusses the conditions described as Concato's and Pick's disease. He concludes as follows: It will be seen from this brief summary that the cases of tuberculous peritonitis, in which surgical treatment promises to be of great aid, rather naturally divide themselves into two groups: First and most favorable are those cases in which a definite anatomic portion of viscus of the peritoneal cavity is involved, such as the fallopian tubes, the ileocecal coil, and the appendix, which can be removed. Second, and less favorable, are those in which the peritoneal cavity contains a considerable quantity of fluid, occupying either the entire peritoneal cavity or a large part of it, or in which the fluid is contained in loculi composed of peritoneal adhesions, dividing the peritoneal cavity into compartments containing fluid.—*Secondary Tuberculous Peritonitis; Its Cause and Cure, W. J. Mayo, J. Am. M. Ass., July 6, 1918, lxxi, No. 416.*

Lupus Erythomatosus and Tuberculosis.—After reviewing the important literature on the subject, the author concludes that the evidence presented in the past to prove that lupus erythematosus discoides bears a relation to tuberculosis is purely presumptive. The facts adduced, that tuberculosis, past or present, may be demonstrated in nearly all cases of lupus erythematosus discoides, should be interpreted rather as further proof of the ubiquity of tuberculous infection and not as evidence of an etiological relationship of the two diseases.—*The Relation Between Lupus Erythematosus and Tuberculosis, F. Wise, N. York M. J., June 22, 1918; cvii, No. 25, 1164.*

Lupus Erythematosus Discoides and Tuberculosis.—Twelve cases of lupus erythematosus discoides were carefully examined for tuberculosis. All available diagnostic methods were employed and a conclusion was reached in each case by study of the combined results. Ten out of the twelve showed indubitable evidence of tuberculosis, past or present, and it is believed that the other two are also tuberculous. In only one definitely tuberculous case was there any likelihood of the presence of a circulating tubercle bacillus toxin. The evidence presented in the past to prove that lupus erythematosus discoides bears a relation to tuberculosis is purely presumptive. Critical analysis of the evidence shows that conclusions drawn from it are based upon erroneous deductions. Conclusion: No evidence has been presented as yet that shows a relation between lupus erythematosus discoides and tuberculous infection or tuberculous disease. It has been shown that tuberculosis past or present may be demonstrated in practically all cases of lupus erythematosus discoides, and this fact should only be interpreted as further evidence of the ubiquity of tuberculous infection and not as evidence of an etiological relationship between the two diseases.—*The Relation of Lupus Eryhtematosus Discoides to Tuberculous Infection, R. S. Weiss and J. J. Singer, Am. J. M. Sc. April, 1918, clv, No. 4, 528.*

Tuberculous Meningitis at Ten Weeks of Age.—This baby died at ten weeks of age of tuberculous meningitis, as proven by guinea-pig inoculation. The child was normal until its last illness, has never been on the street, and the family history was negative as to tuberculosis. The child never received any other food than breast milk and the little water it was given was always boiled. It was taken ill February 7, 1918, and died seven days later. The illness started with mild convulsions, resembling hiccoughs, and lasted about half a minute. On the third day it developed a ptosis of the right eye, which was not constant. According to the statement of the father, a physician, the child showed no stupor or dullness. When the writer saw the child on the third day of its illness, the right pupil was larger than the left and the reaction of both was sluggish. There was some bulging of the anterior fontanelle, slight rigidity of the neck, doubtfully exaggerated patellar reflexes, and the child could be aroused but made no further response. All other signs and symptoms of meningitis were wanting, except for slight twitchings of the angle of the mouth. The

specimen of the spinal fluid stained for tubercle bacilli showed 8 bacilli. The morphology was that of the human type, long, narrow and not broad and thick. The colloidal gold test gave no reaction that was in any way significant. A second lumbar puncture was done and 3 guinea-pigs injected. The findings in the 3 animals were practically the same, and showed extensive tuberculous involvement of the liver, spleen and abdominal lymph glands. The lungs showed only a few scattered tubercles. These guinea-pigs all died in from six to less than nine weeks after receiving the inoculation. From the extent of the tuberculous infection of these pigs it would seem that the fluid must have contained great numbers of bacilli.—*Death from Tuberculous Meningitis in a Breast Fed Infant at Ten Weeks of Age, D. H. Sherman, Report of the 30th. Annual Meeting of the Am. Ped. Soc., Arch. of Ped., June, 1918, xxxv, No. 6, 362.*

Tubercle of Cord and Combined Degeneration of Cord.—Two cases are reported by the author. The first is that of a man, aged thirty-five, who developed gradually pain in the epigastrium with paresthesia, numbness, and weakness of the legs which later developed into spastic paralysis with increased knee-jerk and ankle clonus. He had no symptoms of pulmonary tuberculosis. The urine contained much pus. Tuberculosis was not recognized during life. The patient died seven months after the onset of the illness. Necropsy revealed conglomerate intramedullary tubercle at the level of 7th thoracic vertebra, chronic and miliary tuberculosis of the lungs, extensive tuberculosis of the kidneys, ureters, bladder, prostate and seminal vesicles, and calcified tracheobronchial lymph nodes. Tubercle bacilli were present in large number in the affected area of the cord.

The second case was a man aged forty-six years, who had chronic pulmonary and pleural tuberculosis. He had ataxia of the arms, could not raise himself to a sitting position, could not lift the feet, but could drag the heel up to flex the thigh. He developed retention of urine, cystitis and died eight months after the first admission. Necropsy showed nodular caseo-calcareous tuberculosis of the left apex, right fibrous obliterative pleuritis, calcified tubercles of the tracheobronchial lymph glands, and chronic purulent cystitis. The cord showed a calcified plaque in the arachnoid at the level of the 7th thoracic segment. There was symmetrical degeneration of the tracts of Goll, Burdach, and Gowers with some involvement of the crossed pyramidal tract, and, in the cervical region, of the direct tracts as well.—*Conglomerate Tubercle and Combined Degeneration of the Cord as Complications of Visceral Tuberculosis, P. Bassoe, Arch. Int. Med., April 15, 1918, xxi, No. 4, 519.*

Carcinoma and Tuberculosis of Fallopian Tube.—L'Esperance reports the case of a woman who was admitted to the New York Infirmary with a history of irregular uterine hemorrhages, leucorrhoea, and loss of weight. The uterus was found to be enlarged, firm, irregular and fixed. A diagnostic curettage revealed microscopically an atypical plexiform carcinoma in granulomatous stroma with normal uterine glands. Hysterectomy and bilateral salpingectomy were done. The uterus was myomatous and both tubes inflamed. The left tube presented the picture of pyosalpinx. Miliary tubercles were found scattered through a diffuse granulomatous stroma which had almost replaced the entire mucosa of the tube. The lumen contained necrotic material and few pus cells. The carcinoma had also involved the right tube and here also many necrotic and hyperplastic areas were found resembling tubercles.

Various observers claim that primary carcinoma of the tubes is implanted upon a chronically inflamed mucosa and others have even described the close morphological resemblance between tuberculous changes in the tube and true plexiform carcinoma.—*Primary Plexiform Carcinoma of the Fallopian Tube Associated with Tuberculosis, E. S. L'Esperance, Proceedgs. N. York Path. Soc., October-December, 1917, xvii, Nos. 6–8, 148.*

Tuberculosis of the Uterine Annexa. The pathogenesis of tuberculosis of the tubes and ovaries is a muddled question, because of the many discussions as to the possibility of its being a primary lesion. To read the published works of many it would seem as if the important point was to ascertain whether or not the tuberculous process in the annexa was primary and the only focus of the disease in the patient. The interest of this question is very much more theoretical than practical. In theory, in order that a localized tuberculous process shall be called primary, it is necessary that no structure or viscus shall have been the seat of any tuberculous lesion, no matter how infinitesimal, otherwise the lesion in the annexa must be looked upon as secondary.

In surgical practice, the conception is otherwise, and it is important to ascertain whether the local focus is the only one present and whether no other focus can be detected clinically. Clinically, a minute focus in a lymph node is of little import if it is to remain latent and undetected until its bearer comes to autopsy or the gland is examined microscopically. The evolution and treatment of the apparent lesion will in no way be modified and it has been estimated that only one case of tuberculosis of the annexa out of 100 is theoretically primary, while from the clinical viewpoint from 30 to 50 per cent merit this designation. Logically, the class of secondary tuberculoses must be subdivided still further and, besides the truly secondary lesions, such for instance as a miliary process following a pulmonary tuberculosis, it must be shown that the cases present two tuberculous localizations which are simultaneous and are derived from a common focus, the so called secondary primary localization. For example, a patient with pulmonary tuberculosis infects herself with her own sputum, resulting in an external autoinfection. Then there are those who produce two different successive infections where the bacilli come from two distinct sources. It is most likely that a difference in virulence would result from the difference of the origin of the bacillus. One case recorded by Celler would seem to sustain this point of view.

From the pathogenic viewpoint a distinction is made between those cases in which the bacillus infecting the uterine annexa starts from an already existing lesion in the patient and those in which the organism coming from without simply produces a single focus of infection. Theoretically, this is the difference between primary and secondary cases. A secondary contamination supposes that an initial focus of the disease already exists in the patient and can be recognized clinically. Under these conditions it is more apt to be a pulmonary or intestinal tuberculosis or tuberculous abscess in some cluster of lymph nodes, less commonly cutaneous lesions or those of the bones and joints. The focus may be a latent one and may be often discovered only at autopsy in the tracheobronchial or mesenteric glands.

From the initial focus the bacillus on the road to set up various disseminated foci usually follows the lymphatics, then the venous system, and last the arterial system by which the organism reaches different points of the body. Propagation by tissue continuity can occur by a progressive extension at the periphery of a tuberculous focus. The fact that the bacillus has attained the tube or ovary is not sufficient to explain why it results in an infection of these organs, for it may be destroyed or eliminated, and the question arises as to what circumstances are favorable for its fixation. Of all the genital apparatus the tube is by far the most frequent seat of tuberculosis and the ovary far less so. Anatomically, this is explained by the fact that the tube is an almost closed cavity which favors stagnation of fluids within it, and since the tubercle bacillus is a lazy individual, it can take all the necessary time for the production of its work. The epithelium of the tube is more fragile than that of either the uterus or vagina, and, like the tonsil, the folds of the tubal mucosa seize upon and hold foreign bodies.

Such are the general reasons which explain the greater number of cases of tubal tuberculosis than other similar lesions of the genital tract. But tuberculosis, in order to become implanted in a tissue, has need of a momentary or permanent, or at all events, a somewhat prolonged, suppression of the natural organic defense; this is offered by an inflammatory process, a dystrophy, or a neoplastic process. A well known fact is that acute inflammatory processes, such for example as a gonorrheal cystitis, in many cases prepare the infection of a viscus. The tissue changes resulting from the acute process lose their resistance and in the tube inflammation acts by the desquamation of the epithelium that ensues.

The ciliated epithelium is an excellent barrier against the tubercle bacillus so that when it is shed invasion takes place in the tube just as in the bronchi. Therefore, a gonococcal or puerperal infection of the tube may become secondarily infected by tuberculosis, and this also applies to hydrosalpinx. The gonococcus is unquestionably the agent which the tubercle bacillus most frequently succeeds, but both organisms have been met with simultaneously, while an association with the pyocyanic bacillus has been observed by Williams, Saulmann and Péraire.—*Editorial, N. York M. J., February 9, 1918, cvii, No. 6, 273.*

Urogenital Tuberculosis.—Urogenital tuberculosis is secondary to tuberculosis elsewhere in the body, although it seems to be primary in rare instances. Some cases originate in neighboring organs by continuity or contiguity and by the lymphatics, but in the great majority the infection is carried through the blood stream from a distant focus. As far as the urogenital system is concerned the infection takes place first either in the kidney or in the

epididymis, and is disseminated through this system with the normal current and not against it. It has been proven by experiment that the infection cannot pass up from bladder to kidney unless the ureteral orifices are severely damaged. Infection of the kidney through the lymphatics can theoretically take place, but in such cases the infectious material would have to be enormous in quantity since most of it is sidetracked from the bladder to the lymph-nodes. The history is important in urogenital tuberculosis, but usually the original focus is not very active and the patient is in fairly good health. On examination one may feel an enlarged epididymis, an enlarged kidney due to compensatory hypertrophy or pelvic retention. More often they will not be felt, the patient complaining only of symptoms of cystitis. It should always be remembered that there is no such disease as chronic cystitis per se. Remove the cause and the bladder will get well. The urine in urogenital tuberculosis is acid, unless there is a mixed infection. There is pyuria with no pyogenic organisms present to cause it. The pus cells are lymphocytic or mononuclear, unless there is mixed infection when the picture is obscured also by the presence of other organisms. The tubercle bacilli are looked for by the smear and stain. The smegma bacillus which is at times present is distinguishable by that it is not alcohol-fast, whereas the tubercle bacillus is both acid and alcohol fast. The guinea-pig inoculation test can be made more quickly responsive by previously subjecting the animal to the X-ray. The von Pirquet test is only of value when negative. In late cases the Roentgen ray picture may show calcareous deposits or caseation. Of very great aid in the diagnosis is the cystoscope, but the results are uncertain where there is mixed infection. The location of the foci and the functional capacity of each kidney must then be determined. The treatment is first surgical then medical. Surgery should be conservative. If the epididymis is involved it is removed together with the vas high up, leaving the uninvolved testicle alone. Nephrectomy is not as much recommended as formerly, since the remaining kidney is usually also somewhat involved or may become involved later from the original focus. The real curative work is done after surgical removal of the diseased foci by medical and hygienic measures. Most authorities advocate the use of tuberculin. An early diagnosis is of prime importance.—*Urogenital Tuberculosis, C. Capell, J. Missouri St. M. Ass., March, 1918, xv, No. 3, 77.*

Changes in Trigon Due to Tuberculosis.—The cases cited demonstrate the following points: Tuberculosis of the kidney may lead to great shortening of the ureter, resulting in traction on and marked elevation of the trigon, and invagination of the ureteral ridge into the ureter. Tuberculous ulceration may then produce an undermining of this elevated trigon and finally complete separation of trigon from the bladder beneath, except at the three corners (where the trigon is continuous with the ureteral muscle above and the urethral muscle below). After nephrectomy, healing of the vesical tuberculosis may leave this "trigonal bridge" with new mucous membrane beneath it except at the three corners where the "bridge" is attached and gets its blood supply.—*Changes in Trigon Due to Tuberbulosis of Kidney, Ureter and Bladder, H. H. Young, Surg. Gyn., and Obst., June, 1918, xxvi, No. 6, 608.*

Tuberculosis as a Factor in Chronic Kidney and Liver Disease.—The author found cirrhosis of the liver quite common in tuberculous cadavers at Basel. In some cases no evidence of tuberculosis could be found elsewhere but the discovery of tubercles in the cirrhotic liver or contracted kidney confirmed the tuberculous element. Similar liver findings were encountered also in cattle. These findings formed the connecting link between the experimentally induced cirrhotic processes in the livers of tuberculous guinea-pigs and the spontaneous cirrhosis of the liver in man. Hoessly found cirrhosis of the liver in Greenland where there is no liquor drinking but where tuberculosis is very prevalent. Schoenberg is convinced that tuberculosis is liable to play a predominant rôle in the development also of contracted kidney. Advanced cirrhosis of these organs is almost never encountered in autopsies on consumptives, but amyloidosis and various degenerative changes have long been known and attributed to the toxic element of the infection. In almost all kidneys in tuberculous subjects there is to be found a slight increase of interstitial tissue. These lesions may resemble healed infarcts and, when present in a high degree, they constitute a special form of contracted kidney. This bears a resemblance to scarlatinal nephritis and, like the latter, ends in destruction of the parenchyma and increase of the connective tissue with subsequent fibrosis. Still other forms of tuberculous cirrhosis exist in the kidney the presence of which can be shown only through demonstration of the bacillus and by inoculation. Schoenberg claims to

have been the first to describe a second form of tuberculous contracted kidney. Among the cases cited to sustain this view is that of a woman of twenty-five with the clinical symptoms of pronounced contracted kidney. Necropsy showed a combination of arteriosclerotic and true contracted kidney. The kidneys were also studded with tubercles and tubercle bacilli were found, but no other signs of tuberculosis elsewhere could be detected. In an another case the urine contained pus and tubercle bacilli supposed to come from the left kidney. This kidney was removed but showed no anatomic signs of tuberculosis, presenting merely the aspect of contracted kidney, except for the tubercle bacilli found in it.—*Beziehungen zwischen Tuberkulose und Schrumpfungsprozessen in Leber und Nieren, S. Schoenberg, Corr. Bl. f. Schweiz-Aerzte, December 15, 1917, No. 50, 1726.*

Tuberculous Disease of Larger Joints and Spine.—Waterhouse has a profound faith in tuberculin as a remedy for surgical tuberculosis. In his experience almost all patients benefit from the administration of the drug, provided it is given intelligently, but he has found it impossible to predict, in any individual patient, the amount of the drug which will prove of the greatest service. The vital question is the dose, regarding which he can give no definite rules, but gives the following schedule of the usual way he employs new tuberculin, T. R. The doses are a week apart. First, 1/20,000 mgm.; second, 1/15,000 mgm.; third, 1/12,000 mgm.; fourth, 1/8000 mgm.; fifth, 1/6000 mgm.; sixth, 1/4000 mgm.; seventh, 1/3200; eighth, 1/2400 mgm.; ninth, 1/1800 mgm.; tenth, 1/1500 mgm.; eleventh, 1/1200 mgm.; twelfth, 1/1000 mgm.

When the drug is well borne, and it seems to be further indicated, he gives eight more injections, 1/900, 1/800, 1/700, 1/600, 1/500, 1/400, 1/300, and 1/250 mgm. Beyond this he has never ventured. If a decided reaction should occur after any dose, the same dose is repeated and not increased next time; in ninety-eight cases out of a hundred there will be no reaction. In addition to the use of tuberculin general antituberculous treatment must be employed, as well as special treatment, when dealing with tuberculosis of the joints and spine. Bier's hyperemia treatment is a valuable adjunct in all cases of tuberculosis of the joints. The bandage must be applied neither too tightly nor too loosely. The value of a 10 per cent emulsion of iodoform in glycerin is particularly great in the treatment of tuberculous abscesses, especially when connected with disease of the spine. Not over 5 drams of the emulsion should be used, usually less than half that amount. The abscess should be incised, washed out with sterilized saline, the emulsion introduced and the wound closed. Never, under any circumstances, insert a drainage tube into a tuberculous abscess.

Absolute immobilization of the diseased part until pain, tenderness, and muscular rigidity have vanished, is of prime importance. Operative treatment is called for more often in adults than in children. Tuberculosis of the hip joint is essentially a disease of childhood; the first indication is absolute rest of the joint and separation of the softened bony ends, by putting the patient to bed and applying weight extension. After this has done its work a splint must be applied to enable the patient to get about on crutches. Tuberculous disease of the knee joint may occur at any age; he has seen it start at six months of age and at eighty years. The treatment differs in children and in adults. In the latter operative treatment is indicated, if the disease is at all advanced, but in children this is seldom the case; the indication then is for rest in bed, weight extension, Bier's hyperemia, and iodoform glycerine injections, and later for the patient to be about on crutches wearing a suitable splint and with a patten attached to the shoe of the sound foot.

Tuberculosis of the ankle joint is often met with in adults, the prognosis is relatively good, and the treatment is to fix the foot at a right angle in plaster of paris, or a suitable splint, to apply Bier's hyperemia, and to use the iodoform glycerin emulsion. Tuberculosis of the shoulder joint is usually met with in adults, and the prognosis seems to be better than that of the disease in any other of the six large joints. Fix the limb in slight abduction with the elbow flexed and the thumb directed upward. It is better to have the humerus somewhat abducted, as there will almost certainly be ankylosis. Use the iodoform emulsion. In tuberculosis of the elbow joint conservative treatment frequently secures recovery with a movable articulation, but as ankylosis may occur the elbow should be fixed so that the forearm makes, with the arm, an angle just less than a right angle, with the hand so that the thumb points upward, so that the limb may be useful. Often it is necessary to give an anesthetic in order to get the limb into the proper position. Tuberculosis of the wrist joint may occur at any age, and the writer's experience with it is a doleful one. Operative treatment is generally demanded and the final result is apt to be a not very useful hand. In order

to render the hand at all useful it must be dorsi-flexed, with the forearm, wrist, and hand fixed in immobile apparatus. The first desideratum in tuberculous disease of the spine is perfect rest in the recumbent position in bed, without a pillow, maintained for months, until all pain, tenderness and muscular rigidity have disappeared. Extension and counterirritation should be applied in acute cases. When the disease appears to be quiescent a proper splint can be applied and the patient taken out into the fresh air. Extension and absolute rest form the basis of the treatment. It is better to persist with rest and immobility three months too long than to permit movement one week too soon, for a recrudescence of the disease is far more difficult to treat successfully than the original lesion.—*Tuberculous Disease of the Larger Joints and of the Spine, H. F. Waterhouse, Practit., January, 1918, C, No. 1.*

The Hypertrophic Pseudoneoplastic Tuberculosis of the Tendon Sheaths and Articular Synovia.—A number of types of hypertrophic pseudoneoplastic tuberculous processes are being studied at present, such as massive tuberculosis of the cecum which clinically simulates a true neoplasm and which microscopical examination alone will differentiate. The hyperplastic forms of tuberculous adenitis are another example and, recently, Tedenat has encountered several instances of hypertrophic tuberculosis of the testicle or ovary, which simulated a neoplasm so closely that a mistaken diagnosis might very well be made.

This hyperplastic form of tuberculous inflammation may be met with in nearly all the viscera, but is particularly frequent in the synovial membrane of the joints, where it assumes very different aspects, occasionally offering the clinical type of hyperplastic proliferating fibrous or tuberous synovitis of Koenig. In this case one or several tumors will be detected in the articular synovial membrane, of hard consistency, quite similar to that of fibromata of the breast. These tumors are mobile with the synovia itself, the latter being rather thickened.

Microscopically, it is evident the grayish mass of fibrous aspect is due to typical tubercles undergoing degeneration. In a case recorded by Potherat, the tumor was intimately united to the thickened synovia and offered a uniformly hard and homogeneous consistency. After removal the mass was found to contain in its center a very extensive focus of caseous degeneration, which was surrounded by inflammatory tissue in which numerous giant cells were seen.

A tumor in the knee, having the shape of a large testicle, has been recorded by Conteaud. Its consistency was that of a lipofibroma. It was attached to the synovia by a long pedicle. On section it presented in its center a caseous focus the size of a plum stone and microscopically many typical giant cells were seen. Conteaud believes that this arborescent lipoma of the knee joint was the ultimate outcome of a production of fatty tissue following a chronic tuberculous inflammation of the synovial villi.

Arborescent lipomata not being identical with fungotuberculous synovitis, may be considered, however, as a fatty transformation of the process. It is a change in the synovia such as inflammation can produce. The simple fact of the presence of considerable fatty tissue in what is called arborescent lipomata of the tendon sheaths in no manner authorizes them to be included in the class of lipomata. Tuberculous synovitis of the joints in which there is a predominating element of fat is well known, but one would never mistake these synovitides for a neoplasm.

Stiéda considers arborescent lipoma of the knee a chronic inflammatory process of the synovial villi, with production of fatty tissue, but this is again a hypertrophic, vegetating synovitis, in every way similar to the identical lesion which has been described in other synovia, that of the tendons in particular. The vegetating proliferation does not indicate a reaction of the synovia to infection, either tuberculous or otherwise. The virulence is only attenuated and the reaction takes place in the fibrous and lipomatous form. In a certain number of cases, Kouzine has mentioned the existence of tubercles in various stages of development, and out of a total of 12 cases of articular lipomata, in 5 tuberculosis was evident, four times it was in the neighborhood of the joint, and in 3 it appeared at a late date in the articulation.

Dittrich and Tichoff have also recorded several instances of arborescent lipomata of the synovia of the tendons distinctly tuberculous in nature so that the tuberculous origin of this type of lipoma can no longer be questioned.—*Editorial, N. York M. J., March 23, 1918, cvii, No. 12, 560.*

Normal Weight.—The usual age-weight tables have of late been regarded as inferior to an age-weight-height coefficient. Superior to this again would be an American age-height-weight index. Such a standard is found in two publications: The ninth

Yearbook of the National Society for the Study of Education, Part I, Health and Education, T. D. Wood, Chicago, 1910, p. 34; and Medico-Actuarial Mortality Investigation, Vol. I, *Statistics of Height and Weight of Insured Persons*, compiled and published by the Association of Life Insurance Directors and the Actuarial Society of America, N. Y., 1912, pp. 38 and 67.

In defence of the varying classic age-weight tables, however, and as an indication that finality will remain an academic ideal until the nations become much more intermingled, the following points may be noted in passing:

1. Insurance experts allow 20 per cent plus or minus as a safe variation from the supposedly healthy average normal weight.
2. Considerable variation exists between the averages of different countries, and (within the same country) of different cities.
3. In more than 74,000 observations there was "a difference of 5 inches between the average stature of the best and worst nurtured classes of the community. . . . while. . . . at birth children are of the same average size in all classes.

The relative accuracy of the six methods for estimating normal weight is:

1. Bernhardt's, with an error of about 6 per cent.

$$\text{Wt. in kg} = \frac{\text{Ht. in cm.} \times \text{chest circumference in cm.}}{240}$$

2. United States Army tables, with an error of about 7 per cent.
3. Medico-Actuarial tables, with an error of about 7 per cent.
4. Guthrie's formula, with an error of about 10 per cent.

Wt. in lbs. = 110 + (5.5 × number of inches taller than 5 ft.)

5. Broca's, with an error of about 13 per cent.

Wt. in kg. = Ht. in cm. minus 100.

6. Von Noorden's, with an error of about 20 per cent.

Wt. in kg. = Ht. in cm. — 0.455.

—*Normal Weight, H. Gray and K. M. Gray, Boston M. and S. J., December, 27, 1917, clxxvii, No. 26, 894.*

Variations in Weight with Healing Tuberculosis.—Jchok analyzes the weight findings in about 100 tuberculous French soldiers interned in a Swiss sanatorium. The course at the sanatorium averages sixteen months, and the food averages 3370 calories a day. This includes only 80 grams of fat. The men gained in weight at first but as they improved they lost considerably. This is merely the casting off of the superfluous fat and is not a cause for alarm. As the men resumed exercise and work, the added fat was lost; as there was no return of symptoms, this must be regarded as merely the organism adapting itself anew to the conditions of life. The cicatrization of the infected areas in the lung deprives the body of that much functionally capable tissue; the circulation and total metabolism are reduced in proportion and the body gradually settles into a physiologic balance.—*Die Bedeutung der Gewichtsschwankungen bei der Auskeilung von Lungentuberkulose, Jchok, Corr. Bl. f. Schweiz. Aerzte, February 9, 1918, xlviii, No. 6, 190.*

Lung Cavity Simulating Pneumothorax.—A woman of forty-four with bilateral pulmonary tuberculosis was supposed to have a pneumothorax on the left side, with adhesions. This assumption was based on the history of attacks of pain in the side, with dyspnea, fever and chills; and the facts that dyspnea was the predominating symptom during the last few years, with occasional periods of collapse; that percussion gave a metallic tympanitic ring; that the respiration sound was weakly amphoric with râles only at the apex, and that the roentgen findings positively confirmed the physical diagnosis. Necropsy revealed that what had been supposed to be merely pneumothorax was a huge cavity, the entire lung destroyed. There had been very little bleeding from the lung at any time, and comparatively little sputum. Zandren has found three similar cases on record. As the physical findings are so misleading, an exploratory puncture may be necessary if bronchophony and the pectoral fremitus are not decisive.—*Differential Diagnosis between Large Cavities and Pneumothorax, S. Zandren, Nord. Medic. Arkiv, October, 1917, l, No. 1–2, 163.*

Standards of Diagnosis.—In the diagnosis of pulmonary tuberculosis in adults the following minimum standards have been formulated: When a definite history, constitutional signs and symptoms, are lacking, or nearly so, there should be demanded definite signs in the lungs, including râles at one or both apices persisting after coughing, and present at two or more examinations, the patient being under examination at least one month. In the presence of constitutional signs and symptoms there should be demanded for a positive diagnosis some definite signs in the lungs, but not necessarily râles. Excepting when there is a history of pleurisy, a process at the apex is to be considered tuberculous and a process at the base non-tuberculous until the contrary is proved. A typical pleurisy as well

as a dry pleurisy are presumptive evidence of tuberculosis. The various constitutional signs and symptoms are standardized as follows: Loss of weight, an unexplained loss of at least 5 per cent below normal limits for that particular individual within four months' time. Fever, a temperature which persistently runs over 99—by mouth five minutes—when taken at least four times a day, over a period of one week. Elevation of pulse, an average rate of 85 or over in men and 90 or over in women. The combination of rapid pulse with subnormal temperature as here defined should be considered of great importance in diagnosis. Hemorrhage, one or two teaspoonfuls of blood expectorated with or without sputum. Exposure, childhood exposure or prolonged adult exposure to unhygienic surroundings or habits. Cough, when it persists over six weeks.

In children, the essentials for a positive diagnosis are: Distinct, persistent, and persistently localized adventitious signs (râles) in the chest. Reaction to tuberculin, consisting of an area of hyperemia not less than 5 mm. in diameter, occurring within forty-eight hours after an application of 100 per cent Koch's Old Tuberculin by the cutaneous method of von Pirquet. A diagnosis of tuberculosis can, however, be made when there is an unquestioned hemoptysis with a positive tuberculin test alone. Similarly, in the presence of a radiograph which shows unmistaken mottling well into the pulmonary fields without any sharp outline suggestive of calcification, with a positive tuberculin test in children under four or five years of age, even if constitutional symptoms are absent, and in older children who have frequent cough or rapid pulse or fever, a diagnosis of pulmonary tuberculosis is to be made.—*Pulmonary Tuberculosis in Children and Adults, Standards of Diagnosis and Treatment, D. C. Martin, Monthly Bull., Dept. of Health, City of New York, March, 1918, viii, No. 3, 49.*

Indigocarmin in Tuberculous Cystitis.—In tuberculous cystitis, where there is difficulty in locating the ureteral orifices, the following procedure is recommended: Inject 2 cc. of a saturated solution of indigocarmin into one of the veins of the bend of the elbow after the cystoscope has been used for inspection of the bladder, and while it is still in place. The region of the trigone is then kept under observation for the appearance of the blue color. The time of the appearance of the dye on each side may be recorded. The catheters are then passed into the ureters and specimens collected for microscopic examination. The dye usually appears in from two to twelve minutes

Indigocarmin is the sodium or potassium salt of indigo-disulphonic acid. It is soluble in water 0.8 per cent and is of dark blue color. It is neutral to litmus and can be sterilized by boiling. The phthalein functional test may be employed satisfactorily after using indigocarmin to locate the ureteral orifices. Indigocarmin is stable in watery solutions and in the presence of acetic acid. The dye should be used intravenously only when in complete solution, carefully sterilized and free from any particles. Omission of the latter precaution has been the cause of transitory reactions accompanied by dizziness, pallor and mild shock manifestations.—*Indigocarmin Used Intravenously for Locating Ureteral Orifices in Tuberculous Cystitis, S. P. Martin, Med. Rec., May 11, 1918, xciii, No. 19, 808.*

Percussion and Auscultation in Pulmonary Tuberculosis.—A percussion note which is not very well understood is the dull-flat note. It is shorter in duration and higher in pitch, its acoustic qualities stand between dullness and flatness, or it is a note which is duller than dull. In the presence of early lung infiltration, areas which are normally dull to percussion become dull-flat. The change is unmistakable on light percussion. There is a corresponding proportionate change in the resistance. Just as the change from a normal dull note to dull-flat indicates slight infiltration, so areas of the lung which are normally resonant, when becoming dull-flat, indicate a more advanced process. The apices posteriorly have normally a dull-flat note on percussion, the right apex anteriorly has a dull note and the left apex anteriorly a vesicular-resonant note. Simultaneously with the dull-flat note on percussion, one obtains on auscultation a respiratory murmur which the author designates as semi-bronchial. It is characterized by a type of breathing in which the expiration is prolonged and the pitch intensified as compared to inspiration but not as prolonged as in bronchial breathing.—*Some Recent Studies in Percussion and Auscultation in Pulmonary Tuberculosis, M. Grossman, Med. Rec., June 1, 1918, xciii, No. 22, 944.*

Laboratory Methods.—The Ziehl-Neelsen method is still the most dependable and most widely applicable of staining procedures for tubercle bacilli. The carbol-fuchsin solution should be made from basic fuchsin, which can also be obtained in this country under the name of "aniline red." Three per cent hydrochloric acid in 95 per

cent alcohol is sufficiently strong as a decolorizer as it eliminates the danger of overdecolorization. Dead bacilli stain as well as live ones, so that receptacles and sputum may be sterilized before staining when they are to be kept for any time. The slides may be immersed in cold carbol-fuchsin over night instead of heating for five minutes. For concentrating or homogenizing the sputum antiformin is most widely used, but a 4 per cent sodium hydrate solution is also very active and does not interfere with staining. Detection of bacilli in the blood is difficult and not recommended. For the cultivation of tubercle bacilli Griffith's method of shaking the sputum for a short time with an equal amount of 10 per cent antiformin and planting without previous neutralization has been tried with success. Animal inoculation is still the most reliable and ultimate test of proving the presence of bacilli in suspected material. The delay occasioned in the waiting for evidence of infection in the inoculated animal can be shortened if more than one animal is injected and one is sacrificed at the end of three weeks. The continued absence of tubercle bacilli from the sputum of patients exhibiting abnormal symptoms or pulmonary physical signs should lead to a thorough study of the bacterial flora present and to a reexamination of the patient in the various postures described by Garvin. By these means bronchiectasis and abscess may be diagnosed. Syphilis and malignant disease of the lungs can be ruled out by the Wassermann and x-ray. The complement fixation tests yield positive results in the majority of tuberculous individuals but this test does not indicate the extent of the lesion, nor does it tell us whether the condition is active or latent, healed or open.—*Laboratory Methods in Tuberculosis, B. White, Boston M. and S. J. February 7, 1918, clxxviii, No. 6, 175.*

Demonstration of Bacilli in Spinal Fluid.—The aim is to get the film from the spinal fluid out and onto a cover glass without, as in the ordinary method, having to handle or tease it—procedures which merely knot the film together. Fluid is received in several tubes, five or six mils in each. All shaking of the fluid is avoided, as it reduces the chances of film formation. The fluid is incubated or refrigerated for twelve to twenty-four hours, as necessary. In marked cases the film will often form in a very few hours. It is attached to the bottom of the tube, and also at the top of the fluid, assuming usually an hourglass formation. One quick turn of the tube between the palms of the hands is usually sufficient to detach the film and cause it to float free in the fluid. Half of a Petri dish is now held slightly slanting, a cover glass placed in its dependent portion, and the fluid poured out into the dish and onto the cover glass. The cover glass is pushed with a laboratory needle up toward the shallow part of the fluid until the film still floating free in the fluid engages one corner of the cover glass. The fluid is then drained off by tilting the dish still further, allowing the film to settle, fanlike, over the cover glass. Finally, the cover glass is picked up with forceps, stained, mounted on a blood slide, and examined.—*Modified Technique for Isolating Bacilli from Spinal Fluid in Tuberculous Meningitis, D. P. West, Virginia M. Semi-Month., February, 1918, No. 20, 509.*

The Arneth Formula and Doehle's Inclusion Bodies in Pulmonary Tuberculosis.—The authors made a study of fifty cases of pulmonary tuberculosis in order (1) to study the differential white blood count in the various stages of tuberculoul patients of varying ages; (2) to study the Arneth formula of these patients; (3) to ascertain whether Doehle's leucocytic inclusion bodies are present; (4) to compare the results obtained and to give, if possible, any relation between these results and the clinical picture. The average age of the patients was 32.5 years, the majority being between thirty and fifty years of age. They reached the following conclusions: (1) In pulmonary tuberculosis decided alteration in the differential blood picture is found. (2) The more advanced the disease the higher is the percentage of polymorphonuclear neutrophiles, and the lower the percentage of lymphocytes. (3) In cases tending to recovery the percentage of lymphocytes increases. (4) The Arneth formula shows that in pulmonary tuberculosis a large number of immature leucocytes occur in the blood stream. (5) The more advanced the disease the higher is the Arneth's index. (6) Arneth's index shows in a general way the progress of the disease. (7) Doehle's inclusion bodies are present in pulmonary tuberculosis, especially in advanced cases.—*The Differential Blood Count. The Arneth Formula and Doehle's Inclusion Bodies in Pulmonary Tuberculosis (With One Chart), B. W. Bachman and B. H. Lucke, N. York M. J., March 16, 1918, cvii, No. 11, 492.*

A New Antigen for Complement Fixation.—Tubercle bacilli are isolated and grown from sputum on Petroff's medium. When the cultures show an abundant growth, forming definite raised masses,

the organisms are scraped from the surface of the medium with a heavy platinum wire. It takes from four to eight weeks for the growth to become sufficiently abundant. The tubes of media are plugged in the ordinary manner. Every few days a portion of a cubic centimeter of water is added to the tubes. In all cases a number of different strains of organisms are used in making one antigen, and the number has varied from four to ten strains. The organisms are placed in a sterile open Petri dish or watch glass and allowed to dry over night in a bacteriological incubator at 37°C. The partially dried bacteria are weighed and then placed in a larger, sterile, clean mortar. They are ground for three to four hours, vigorously and constantly. From time to time during the grinding, a scalpel is used to scrape the bacterial mass from the sides of the mortar and from the pestle. A few drops or as much as 1 cc. of sterile distilled water is added when necessary to keep the mass of the proper consistency. Addition of sufficient water to make a fluid mass should be strictly avoided. After grinding the necessary length of time, 0.85 per cent sodium chloride solution is added little by little, and the grinding is continued until the bacteria or remains of the bacteria form an even suspension in the diluent. Sufficient of the sodium chloride solution is added to make a 0.5 per cent suspension of bacteria. To this there is added an amount of 5 per cent carbolic acid equal to one-tenth the volume of the sodium chloride solution. The finished antigen is dense, grayish, and opaque. The bacterial bodies and suspended cell-remains settle to the bottom, if the suspension is allowed to stand. The supernatant fluid is very slightly opalescent. Before use the antigen should be shaken so that the solid parts are again brought into suspension. One can obtain with this antigen results equal to those obtained with any of the antigens which have been proposed by others. It possesses two further merits which have not been claimed for other antigens. First, owing to the addition of carbolic acid, it is sterile and remains sterile; second, it is stable, changing little if at all in its antigenic titer over a long time.—*An Antigen for Use in Complement Fixation in Tuberculosis, M. S. Fleisher and G. Ives, J. Lab. and Clin. M., February, 1918, iii, No. 5, 302.*

Complement-Fixation in Childhood. The cases tested were taken from the pediatric service of Mount Sinai Hospital, New York. The Wassermann system was employed for all tests with the antigens of Miller and Petroff. The sera of 59 patients from six months to twelve years were tested. Sixteen cases were tuberculous, 6 suspicious, and 28 non-tuberculous. Among the former group were 6 cases of tuberculous meningitis. Complement-fixation reactions on the blood of these patients with both antigens was negative in 4 and only suspicious in 2 cases. It might be said that the lowered vitality failed to stimulate the formation of antibodies, thus no inhibition takes place. Whatever the explanation, the test was found of no value. Of 7 cases of pleural effusion 1 was definitely tuberculous, 3 were probably tuberculous, and in 3 others the etiology could not be definitely determined. In these cases the complement-fixation tests were negative with both antigens. The serum of the 3 patients in whom the etiology was not definitely determined gave negative reactions also. Of 6 children with pulmonary involvement, 2 being cases of miliary tuberculosis with the usual course, all gave negative reactions with both antigens. One case of tuberculous peritonitis gave a negative reaction with both antigens. The diagnosis was subsequently confirmed by autopsy. Among 28 cases with no signs or symptoms of tuberculous infection complement-fixation tests revealed 3 strongly positive relations, 1 faint inhibition, and 1 suspicious reaction. From this series of complement-fixation tests for tuberculosis on the sera of 17 tuberculous infants and children with Miller's and Petroff's antigens 1 gave a 4 plus, 1 a 2 plus, and 2 suspicious reactions. Tests on the sera of 5 children probably not definitely tuberculous were all negative with both antigens. Of 28 tests on non-tuberculous infants and children 3 gave a 4 plus and 2 a suspicious reaction. Before discarding the test for children it is better to look for further improvement in the technic.—*The Complement-Fixation Test for Tuberculosis in Infancy and Childhood, H. Heiman, Report of the 30th. Annual Meeting of the Am. Ped. Soc., Arch. of Ped., June, 1918, xxxv, No. 6, p. 342.*

Tuberculin in Diagnosis.—A positive cutaneous reaction to tuberculin per se, even in very young children, is of no more clinical significance than in the adult. The subcutaneous test with old tuberculin is the only form of tuberculin test that affords information of clinical value and here we depend upon the occurrence of general and focal reactions as indicative of actual clinical disease. To be conclusive the rise of temperature accompanying a positive general reaction should be at least two degrees in excess of the maximum of the day before. For the detection of focal

reaction it is of course necessary to have a complete record of the previous physical findings available for comparison. In general it may be said that localized pain, irritation, tenderness on pressure, increased vascularity and secretion, alone or combined, characterize the symptoms of focal reactions to tuberculin in any part of the body.

In the infected organism with the evolution of tubercle the highly soluble metabolic products of the bacillus, the exotoxins, become available at once and their related lysins are the first to appear. The endotoxins are not available until tubercle bacilli have died and have become disingrated in the tissues. The vitality of the bacillus is so great and the resistance to disintegration so marked, that specific lysins for the endotoxins become available much later, and at first in only minimal amounts. Accordingly, in recent infections reactions may take place to the administration of exotoxins, but not in old cases. The failure of a positive reaction may depend on two reasons: (1) The hypodermic administration of tuberculin represents the first parenteral introduction, and its related specific lysin is not yet present in the organism. (2) Previous administration or absorption of the identical antigen has resulted in the presence of the related lysin in amounts sufficient to completely reduce the toxin injected. The advantage would therefore seem obvious to employ for diagnosis a test fluid which contains all of the several exotoxins and endotoxins of the tubercle bacillus in solution, instead of old tuberculin which contains, in appreciable amounts at least, only the exotoxins. Von Ruck has abandoned the use of old tuberculin and the cutaneous test and now depends entirely upon the vaccine given subcutaneously. Thus a deficiency in any of the specific lysins in the reacting organism is augmented and the formation of lacking ones is stimulated. No greater number of doses is required than is usually given in the gradually applied subcutaneous test with old tuberculin. A complete and maximal degree of immunity is produced, the test being thus also a curative measure. —*Tuberculin as a Diagnostic Agent. S. von Ruck, Tex. State J. of Med., Novem-ber, 1917.*

Tuberculin Tests in Childhood.—A positive subcutaneous test requires that at least 1° of fever be registered above the normal after an injection of a specified amount. The temperature should be taken for at least three days preceding the injection. In children the initial dose should be not over 0.1 mgm. If there is no response to this dose within forty-eight hours 1 mgm is given, increasing the next doses to 3 and 5 mgm. respectively if no reaction is obtained. The test should be given a wider application; reactions should not be feared in glandular cases, for when they occur they are beneficial.

The von Pirquet skin test, when positive should be supplemented by some other test to determine whether the case is active.

The advantage of the intracutaneous test over the von Pirquet consists in its certain absorption and its elasticity in regard to the dose desired. Very high dilutions of tuberculin can be given intracutaneously and the amount injected controlled accurately. It is of value in determining the degree of hypersensitiveness in demonstrated tuberculosis for the purpose of estimating the initial therapeutic dose of tuberculin.

Through his multiple papillary cutaneous test, Ellis claims to be able to detect the various stages of tuberculosis from the latent to the advanced stage. The test furthermore indicates the amount of tissue involved and points the way to an accurate prognosis and treatment.—*A Comparison of the Various Tuberculin Tests in Childhood, E. F. Warner, Arch. of Ped., January, 1918, xxxv, No. 1, 28.*

Tuberculin Tests in Children.—The reactivity to tuberculin undergoes changes. An individual may react in one instance and though still tuberculous, may not react to the same dose at a subsequent test. Practically one, or at most two tests, are sufficient, but for a statistical survey of the frequency of tuberculous infection, it is not enough. The most common tests in children are: (1) von Pirquet, (2) Stich reaction of Escherich, (3) conjunctival, (4) Moro's cutaneous, (5) intracutaneous. Of these the most extensively used is the von Pirquet. The author repeatedly tested a number of children in order to detect the hidden cases of infection, using the following procedure. Each child was given a von Pirquet and was observed after twenty-four hours, and again after forty-eight hours. If positive this was regarded as evidence of tuberculous infection. If negative after forty-eight hours another test was made, and after forty-eight hours a third If this proved negative, an intracutaneous injection was made with 0.1 cc. of a 1:1000 old tuberculin. If after forty-eight hours this was negative 0.1 of a 1:100 solution was injected and repeated after forty-eight hours if negative. If after these 6 tests the case still failed to react, it was considered definitely negative. In all, 1165 tests were

made on 206 inmates of the Home for Hebrew Children (N. Y. City) varying in age from a few days to six years none of whom showed clinical evidence of tuberculosis. Fifty-two or 25.2 per cent gave a positive reaction to some of the tests. If only one test would have been made, an incorrect conclusion that only 3.3 per cent had tuberculous infection would have been obtained. There was a step-like increase in disease incidence with increasing age. As control 20 children were injected intracutaneously with a solution of broth, peptone, and glycerine, diluted like the tuberculin. None of these showed any reaction. Some of the children showed very marked local reactions with tuberculin. Many of these were prone to skin eruptions, to which fact may be ascribed the intensity of the reactions. Tuberculous infection acquired in childhood has a distinct bearing on the disease as it appears in later life. By following up a series of cases such as here reported, we may arrive at the definite relationship between tuberculous susceptibility and tuberculous disease.—*Cutaneous and Intracutaneous Tuberculin Tests in Infants and Children, M. H. Bass, Am. J. Dis. of Child., xv, No. 5. 313.*

von Pirquet Reaction in Children.—Six hundred and fifty-eight children ranging in age from two months to thirteen years were subjected to the von Pirquet test, using Koch's Old Tuberculin, full strength. In no case was there a history of tuberculosis in the family. The series consisted of the average type of children of the lower East Side of New York, the parents being mostly of foreign birth. Sixty-one or 9.2 per cent gave a positive reaction. The percentages for the different ages were as follows: Under one year, 1 per cent; one to two years, 1.2 per cent; two to four years, 5.7 per cent; four to six years, 9.9 per cent; six to eight years, 10.25 per cent; eight to ten years, 15.95 per cent; ten to twelve years, 47.62 per cent; twelve to thirteen years, 50 per cent. These figures would seem to give a fair estimate of the frequency of infection with the tubercle bacillus in children with healthy parents in New York City. There was malnutrition in 93 cases of the whole series. Of the 61 showing a positive reaction, 22 had enlarged cervical glands, 18 of which were diagnosed as tuberculous; 9 had diseased or hypertrophied tonsils; 11 had decayed teeth; 18 had lung symptoms, such as bronchitis, etc.; 7 had dullness or increased vocal fremitus in some part of the lung; 19 were malnourished and anemic; 1 had enlarged superficial veins of the chest; and 38 had fever. There was one with skin and bone tuberculosis between one and two years of age. Of those with evidence of lung involvement, 5 showed pathological x-ray findings. In young children a positive reaction indicates a recent infection that is active or partially healed. In older children the reaction indicates by its intensity the hypersensitiveness of the child, rather than the degree of the disease. When the reaction comes on quickly it indicates an active focus; a slow or delayed reaction means a latent focus. Some children do not react to the first but do react to the second test. From a comparison of the results of the present investigation with the findings of other investigators, such as Veeder and Johnston, Hamburger and Monti of Vienna, Alan Brown of New York, and Park and Krumwiede, the author concludes that the incidence of tuberculous infection in children varies not only in different countries but in the various cities of the United States. The incidence is also markedly different in hospital patients from children coming to outpatient clinics.—*Infection of Children with the Tubercle Bacillus, E. M. Sill, N. York M. J., June 1, 1918, cvii, No. 22, 1018.*

Diagnosis of Enlarged Lymph Nodes. An adenitis in a child under two years is likely to be a simple rather than a tuberculous inflammation, over two years it is more likely to be tuberculous. But even in early life widespread tuberculous lymphadenitis may occur in susceptible infants. Here the factors of diet, nature of milk used, surroundings and history of exposure will aid in the diagnosis. A negative history of contact is more important than a positive. Tuberculous adenitis is rarely acute in onset. A slow increase of the swelling with gradual involvement of more than one node, with delayed cellular tissue infiltration, and delayed amalgamation of skin with deeper structures speak for tuberculosis. In early infancy, however, a rapid and acute onset may characterize tuberculous swelling and will tax the diagnostic skill. When the enlargement has lasted over three months there should be a presumption of tuberculosis, although mild simple infections may run such a course. A single, slowly enlarging node, particularly if it be the tonsillar nodes, points to tuberculosis. Simple adenitis usually presents in a fairly early stage enlargement of several nodes; tuberculosis in the later stages does it. Inflammation of the structures in the mouth, throat and naso-pharynx points to the diagnosis of simple or pyogenic rather than tuberculous node enlargement. The character of the swelling is of less impor-

tance than the history, course, and various examinations. Persistence of discharging sinuses point to tuberculosis. In the tuberculous variety the anemia is more marked; leucocytosis is a sign of pyogenic infection but will be present in tuberculous adenitis with secondary infection. A negative von Pirquet is of value; a positive complement fixation test does not prove that the enlarged glands are tuberculous, but that there is tuberculosis somewhere in the body.—*The Differential Diagnosis of Enlargment of the Cervical Lymph Nodes, R. S. Haynes, Arch, Ped., April, 1918, xxxv, No. 4, 226.*

Diagnosis by X-ray.—It is not easy to differentiate clinical from roentgenologic tuberculosis. In active disease one sees an irregular, spotty infiltration of the lung of a rather fuzzy nature. In the healed or dormant type there may be well-defined areas of density with clear-cut margins, or there may be calcified nodules, the latter indicating very old disease. Often one cannot distinguish between the two types in question from the x-ray plate alone. One must, in addition, take into consideration the physical signs. One individual may have marked lesions in both lungs and be apparently enjoying good health and showing none of the signs of the disease, whereas another with only slight lesions may be confined to bed and be expectorating tubercle bacilli.—*X-ray Diagnosis of Lung and Pleural Diseases, I. P. Heymann, Med. Times, xlvi, No. 4, 98.*

Tuberculosis and X-Ray Plates.—A study of the x-ray findings in the chests of 150 normal children was undertaken in order to ascertain how often will be found structural changes in the lungs resembling those found in admittedly tuberculous cases. One hundred of these children came from Atlanta where they lived under hygienic conditions prevalent in a large city; the other 100 children had lived under ideal surroundings as regards climate, altitude, etc. No material difference between the two groups was found. Of those living at Highlands 22 per cent showed no changes in the bronchial glands or lungs deserving the name of structural changes; of the Atlanta children 17 per cent were similarly negative. The cases which did show structural changes are grouped in four classes: Class I, those with moderate enlargement of the bronchial glands with little or no infiltration of the lungs. Class II, enlargement of the bronchial glands with beginning lung infiltration. Class III, considerable enlargement of the glands, marked infiltration of the lungs with calcified nodules. Class IV, typical tuberculous conditions. Belonging to Class I were 24 Atlanta cases; 16 below the age of ten and 8 between ten and fifteen. Forty of the Highlands children belonged to this class. Eight were below ten, 17 between ten and fifteen, 9 from fifteen to twenty, and 6 over twenty. In Class II there were: In Atlanta, none below ten, 5 from ten to fifteen, and 2 over twenty; in Highlands, none below the age of ten, 8 from ten to fifteen, 5 from fifteen to twenty, and 3 over twenty. In Class III there were: from Atlanta, none below the age of ten, 4 between ten and fifteen, 1 between fifteen and twenty, and 3 over twenty. In Highlands, 2 under ten, 8 between ten and fifteen, 5 between fifteen and twenty, and 4 over twenty. In Class IV: from Atlanta, 1 of thirteen and 1 over forty; in Highlands, 3 over twenty. Although none of these cases had the clinical features of tuberculosis, many had the changes typical of the disease and a few probably had tuberculosis.

X-ray plates teach us that tuberculous processes originate in the bronchial glands and extend into the lungs from them; that enlarged bronchial glands and thready infiltration of the lungs are common in children; that the presence of these changes need not be associated with the disease called tuberculosis, but that these processes follow a more or less uniform course until secondary complications take place in the terminal areas of the bronchi. We need a research study of the relationship of the perversions of functions in the vegetative nervous system and the ductless glands to occult tuberculous toxemias before we can adequately recognize all the deviations from health which may represent a tuberculous etiology. Many of the functional diseases of childhood are secondary and symptomatic manifestations of occult tuberculous toxemias. Tuberculous processes do not originate at a definite time in consequence of a definite exposure, but begin their development in earliest life, persist indefinitely, and owe their dangerous features to causes not understood and greatly in need of research study. The best prevention of tuberculosis consists in the earliest possible recognition of the deviations from health caused by the assumption of pathological properties by tuberculous processes commonly present in the lungs and bronchial glands and usually harmless.—*Tuberculosis and x-Ray Plates, Mary E. Lapham, N. York, M. J., February 16, 1918; cvii, No. 7, 294.*

Chest Examinations.—All the patients had passed the preliminary examinations as recruits, and were sent to the roentgen laboratory because of developed lesions, or suspected pulmonary disorder. In practically every cases, the roentgen findings have been confirmed by physical and clinical examinations. A list of pulmonary disorders found in a total of 1259 individuals is given. In 405, no disease was revealed. In 368 there was tuberculosis, and lobar pneumonia followed next in order in 258 cases, broncho-pneumonia in 61, and chronic bronchitis in 49. There were three of interlobar pleurisy, 25 of pleurisy with effusion, 3 of hydropneumothorax, seven of empyema, 2 of emphysema, and 1 with enlarged mediastinal glands. Pulmonary tuberculosis is revealed by the roentgen ray even in its earliest stages, but its demonstration depends on the care in the technic and the keenness of the interpreter. The most definite signs of the active disease as seen on the roentgenogram are soft, fuzzy, flaky shadows in the areas occupied by the linear markings of the normal lungs. When these shadows are found at the periphery and are mottled as if broken up with shadows indicative of peribronchial thickening leading to them, the author considers them characteristic of acute, active tuberculous lesions. When this is noticed near the apex, it is the most definite sign of active phthisis that the roentgenogram presents. When, however, the shadows appear dense and are accompanied by nodular, well defined, clean cut peribronchial thickening extending to the periphery they are considered to indicate healed, or at least inactive, tuberculosis. While these two extremes are readily detectable in the roengenogram the less marked cases require a skilled examiner with much practice. The upper region, from the apex to the hilum, is considered the tuberculous area, and 93 per cent of the positive cases showed the lesion in this region, more especially on the right side. The middle region from the hilum to the fifth rib shows occasional lesions found by the author in less than 10 per cent of the tuberculous cases. The lower region, from the fifth rib to the diaphragm, rarely reveals lesions, and only five cases, out of the 368, showed them so situated. Davis does not consider opacity in one of the apexes, as compared with the other, as especially significant. It may be caused by muscular development, thickened pleura, etc. Hilum thickening cannot be considered a safe criterion in the diagnosis, and Davis is in accord with the view that pulmonary tuberculosis cannot be fairly and definitely diagnosed, except by combined consideration of the physical, clinical and roentgen findings. Shadows are often found in examining pneumonia patients, strikingly similar to those seen in phthisis, but which disappear after recovery; and in making the diagnosis the examiner should make sure as to the recent occurrence, or not, of pneumonia. He believes they are caused by sheets of fibrin deposited on the pleura during the infection. The roentgen signs of lobar pneumonia are: (1) marked accentuation of linear shadows from the hilum to the apexes, which is called vascular congestion; (2) marked enlargement of the heart shadow; (3) typical shadow of the localized area of consolidation in the lungs, and (4) high diaphragm on the affected side. The shadows are interpreted as due to the congestion of blood vessels along the bronchi. The enlarged heart has been found in every case, except two, and it occurs early. The consolidation appears mostly in the lower lobes. In the 258 cases, thirty-one showed no consolidation in any part of the lungs, and no physical signs were detected, though the clinical symptoms were definite, and the enlarged heart was present. This would seem to support the view that the symptoms of pneumonia are more dependent on toxemia than on consolidation of the lung. It is difficult to determine in case of consolidation whether fluid is present in amount to demand aspiration. In the cases observed of lobar pneumonia pleuritic effusion occurred early in many. While it is generally supposed that broncho-pneumonia is a bilateral disease, Davis found it more frequently unilateral, and the enlargement of the heart is not common. Broncho-pneumonia is often overlooked in a physical examination, as the symptoms may be indefinite and noncharacteristic.—*A Roentgen Study of One Thousand Chests at Camp Devens, Mass., E. L. Davis, J. Am. M. Ass., lxx, No. 21, 525.*

Roentgen Signs of Tuberculosis.—Weil enumerates among other signs the unchanging aspect of the shadow of the apex during breathing or coughing while the rest of the lung grows lighter. If the shadow of one apex clears up some time before that of the other apex, this must be regarded as suspicious, as also the lagging behind of one-half of the diaphragm. But the most instructive sign, perhaps, is the fact that with old tuberculosis, tending to fibrous retraction, the apex looks small and pointed, while with active tuberculosis, especially in the young. the congested apex is seen to be larger than normal; the whole lung seems spread out and the ribs are

raised. The ribs make slight or no excursions in either case.—*Signes radiologiques de la tuberculose du début, E. Albert Weil, Paris Méd., March 2, 1918, viii, No. 9, 190.*

Tuberculosis of Lungs as Shown by Roentgen Ray.—Among 984 roentgenograms of different patients at Fort Bayard, 394 showed paravertebral tuberculosis as a marked feature. Only 2 cases of strictly apical tuberculosis were found. Eighty-two patients showed paravertebral tuberculosis alone (thickened lines with studding extending toward or to the apices). Thirty-nine of the latter had not reached the apex. Forty-five of the 82 cases of paravertebral tuberculosis gave no definite physical signs. All of the 82 patients had at some time shown symptoms of tuberculosis, such as cough, expectoration, pleurisy pains, bleeding loss of weight, fever, night sweats, malaise, etc. All of the 82, with 2 exceptions, had at some time or other had a positive sputum. Of 62 patients in the incipient stage admitted since January 1, 1915, 37 had no physical signs; all had or had had symptoms; all except 1 had or had had a positive sputum; plates of all except 2 showed paravertebral tuberculosis above hiluses; of these 2 had a basal pleurisy, the other a few scattered foci, some of which were in the outer part of the lung.

Bushnell is of the opinion that these figures give evidence conclusively of the importance of tuberculosis of the deep lung in the early history of pulmonary tuberculosis. The so-called incipient cases are not truly incipient, they are, as a rule, detected when the deep tuberculosis has begun to invade the superficial lung, when on tuberculous lymphangitis or peribronchial bronchopneumonia there has been engrafted a larger focus of bronchopneumonia involving the cortical lung, the so-called primary lesion. Truly incipient tubercle gives no symptoms. Loss of weight, malaise, fever, cough and expectoration, hemoptysis, night sweats, are not symptoms of incipient but of advanced tuberculosis. Their development marks in a general way the progression of the disease from the benign lymphangitic stage to that of tuberculous bronchopneumonia, whether this disease manifests itself in the form of numerous minute foci immediately surrounding the larger bronchi or of single or few larger foci in the superficial lung. Physical signs of the deep tuberculosis are absent or indefinite. The diagnosis depends almost entirely on roentgenographic examination.—*Extension of Tuberculosis of Lungs as Shown by Roentgen Ray., G. E. Bushnell, Southwest, Med., May 1, 1918, No. 5.*

Fluoroscopy of Chest.—In inspecting the chest with the fluoroscope, attention should be given to the lung fields, heart and mediastinal outlines, excursion of the diaphragm, topography and action of the ribs, the apices and the lung parenchyma. The ability of the fluoroscope to demonstrate the condition of the hilus of the lung is important because the hilus is usually involved before the apex and physical examination is unable to indicate its condition. The severity of a tuberculous hilus involvement is an index also of the prognosis of the disease. In differentiating chronic bronchitis and broncho-pneumonia respectively from tuberculosis and lobar pneumonia it is important to note that the adventitious shadows in bronchial affections are limited to the region of the bronchial tree and do not affect the distal parenchyma, whereas in tuberculosis and lobar pneumonia the adventitious shadows always extend well into the parenchyma.—*Fluoroscopy in the Diagnosis of Chest Conditions. A. F. Holding and M. Greenwald, N. York M. J., June 8, 1918, cvii, No. 23, 1072.*

X-Ray Diagnosis of Cavities.—About one-half of tuberculous cases with cavitation show on roentgenoscopy the typical well-known light area surrounded by a dark ring. There are, however, two other radiographic manifestations of pulmonary cavities which the authors compare respectively to a porous loaf of bread, cut across (mie de pain); and the honeycomb type (nid d'abeille). Among 350 cases, about one-seventh showed either or both of these newly described types. On the other hand, these findings were not found in a single case out of 350 patients with closed or suspected tuberculosis. The importance of these shadows as significant of tuberculous cavities was always confirmed by physical examination and, where opportunity offered, by necropsy. The porous, bread-like picture is the more common of the two, and on coughing is displaced en bloc towards the hilum. The honeycomb type is more often found in the upper portion of the lung, is not displaced by coughing, and may be overlooked on radioscopic examination but will be found on the x-ray plate. Either of these shadows may be mistaken for fine bronchial ramifications or for various shadows at the hilum. While they usually are found in cases where there are numerous areas of destroyed lung tissue, they have been found once in the case of a large cavity with fibrous bands traversing it.—*Les images cavitaires dans la tuberculose pulmonaire, Ch. Mantoux and G. Maingot, Presse Méd., March 7, 1918, No. 14.*

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* "The Choice of Tuberculins," by Benjamin White, Otisville, N. Y., Department of Health, City of New York. Read at the annual meeting of the Medical Society of the State of New York, at Saratoga Springs, May 18, 1916.

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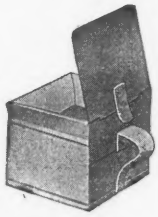

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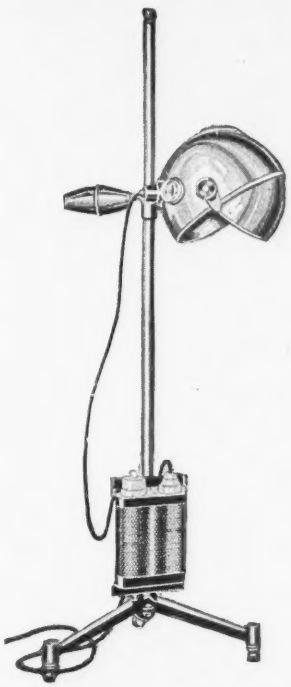

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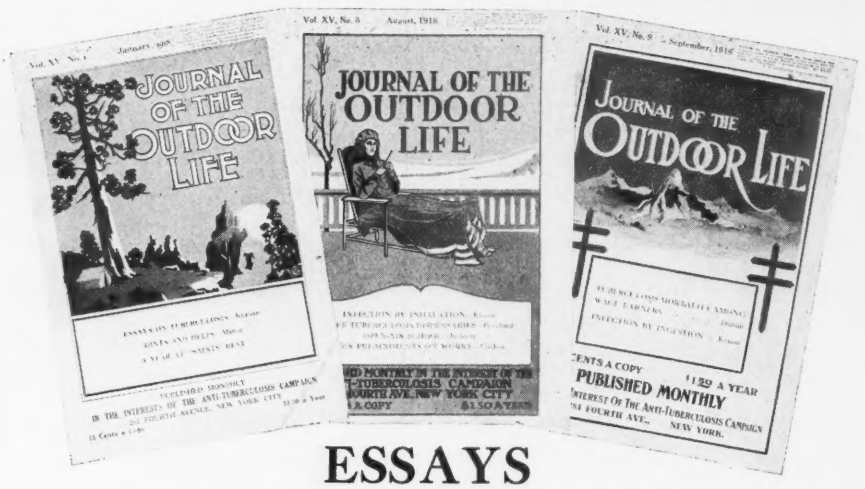

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